THE MUNICIPALITY OF METROPOLITAN TORONTO

SWEAP

1953

SOLID WASTE ENVIRONMENTAL ASSESSMENT PLAN

Component 7: MASTER PLAN

Discussion Paper No: 7.1

Title: TOWARDS A SOLID WASTE MANAGEMENT MASTER PLAN

Date: JANUARY, 1990

DEPARTMENT OF WORKS
SOLID WASTE MANAGEMENT DIVISION

To comment on this document or to obtain a copy, contact:

SWEAP
Metropolitan Toronto
Works Department
439 University Ave,
20th Floor,
Toronto, Ontario
M5G 1Y8

(416) 392-5420 or 1-800-387-9200

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COMPONENT 7

MASTER PLAN

DISCUSSION PAPER NO 7.1

TOWARDS A SOLID WASTE MANAGEMENT MASTER PLAN:

A STATUS REPORT ON METROPOLITAN TORONTO'S PLANNING PROCESS

METROPOLITAN TORONTO
DEPARTMENT OF WORKS
SOLID WASTE MANAGEMENT DIVISION

BY:
THE PROCTOR & REDFERN GROUP

January, 1990

EXECUTIVE SUMMARY OF DISCUSSION PAPER 7.1 ENTITLED - TOWARDS A SOLID WASTE MANAGEMENT MASTER PLAN: A STATUS REPORT ON METROPOLITAN TORONTO'S PLANNING PROCESS

PURPOSE OF DISCUSSION PAPER NO. 7.1

Discussion Paper No. 7.1 represents an important step in the development of a long-term solid waste management system for the Municipality of Metropolitan Toronto (Metro) and provides the basis from which public consultation and subsequent technical activities should be undertaken. In this regard, it is important that participants in Metro's Solid Waste Environmental Assessment Plan (SWEAP) planning process understand the purpose and intent of the Discussion Paper which is:

- to consolidate and summarize information prepared by Metro and its consultants. A comprehensive data base is available on the quantities, sources and types of solid waste currently generated in Metro. Data on the composition of solid waste requiring future management are sufficient for this stage of the planning exercise. However, more waste composition data are required as the planning process develops and programs and facilities proceed to implementation,

- to identify the study area, and to determine waste management needs and facility siting opportunities within that study area. It has been decided by Metro that the study area relative to waste management needs should include Metropolitan Toronto and its six area municipalities. In other words, the quantity of solid waste generated in Metro by both public and private sectors represents the extent of the "problem" for waste management planning purposes,

- to discuss the siting of waste management facilities which considers a broader study area beyond Metro Toronto,

- to respond to the waste diversion from landfilling objectives established by Metro Council and the Province. Metro's objectives are to divert solid non-hazardous waste from landfill. Provincial targets are to divert this waste from landfill and incineration,

- to develop for further consideration by Metro Council, solid waste management policies and long-term objectives. The preparation of this Discussion Paper considered the draft waste management policies that were provided to Metro Works Committee in January 1989,

- to establish the philosophical and practical objectives upon which to form the basis of a system. The process must be rational, understandable, fair and one that fully complies with the Environmental Assessment Act (EAA), other relevant provincial legislation, public and government agency input and most importantly, the needs and priorities of the Metro community,

- to outline the basis for establishing a 40-year or longer solid waste management master plan. There is a need for an ambitious plan that strives towards near-zero waste generation and, hence sustainable development,

- to establish a rationale and the approach that can be used to develop and then evaluate alternative approaches to manage solid waste over the next 20 years and longer. Three "Alternative" waste management systems were developed and are presented in the Discussion Paper, and

- to identify evaluation factors that could be used in subsequent Metro studies leading to the development of the Solid Waste Management Master Plan. System "screening" factors have been used to develop and select the three alternative systems. It is intended that system "comparative" factors be used to evaluate and compare the three alternative systems as well as those alternatives and modifications that might result from public and government agency review of the Discussion Paper.

INPUT FROM OTHER PARTICIPANTS

The Discussion Paper describes the status and progress to date of the broader SWEAP planning process that was initiated with the preparation of the "Appraisal Study" in 1986. Metro staff and the SWEAP Technical Group assisted Proctor & Redfern in the preparation of the details of this Discussion Paper. The SWEAP Technical Group, which included Metro staff, legal counsel, and consultants, provided a useful and necessary "review/advisory panel" function in the preparation of this document.

Key inputs have been the two workshops for Metro Councillors held in July and October 1989. Both workshops provided insights and ideas which were incorporated into the Discussion Paper. Councillors expressed concern at the first workshop about the consideration in the plan of waste reduction and reuse programs. This led to a higher priority being given in these waste management approaches in the development of alternatives. Councillors also pointed out that consideration of a 20-year period for planning was not comprehensive enough, nor would it provide for the innovative planning required to solve Metro's long-term needs. The Discussion Paper includes discussion on the 40-year and longer period.

The comprehensive public participation program which has been organized by Metro has provided another source of views, ideas and direction to the preparation of the Discussion Paper. The Multistakeholder Committee (MSC), the public's core committee made up of representatives of five Advisory Caucuses from five distinct and differing interest groups, addressed several important matters such as the priority of waste management approaches and the philosophy of waste master plan development. Comments received from SWEAP public groups, interested citizens and government agencies also assisted in the preparation of this document.

SOLID WASTE GENERATED AND MANAGED IN METRO

Metro manages solid waste generated within Metro as well as for several jurisdictions located outside of Metro including the Region of Durham and the Region of York. In 1988, approximately 3,294,000 tonnes were managed by Metro as follows:

■ Keele Valley Landfill	2,186,000 tonnes
■ Brock West Landfill	1,042,000 tonnes
■ Commissioners Street Incinerator (Closed-August 1988)	66,000 tonnes
Solid Waste Managed By Metro in 1988	3,294,000 tonnes

Forecasts of solid waste generation for the next twenty years are summarized in the Discussion Paper. The forecasts considered population projections prepared by Metro Planning, and the estimates of the quantity of solid waste generated in 1988 in Metro, which are as follows:

■ Domestic Wastes	917,885 tonnes
■ Commercial and Industrial Wastes	1,716,534 tonnes
Solid Waste Generated in Metro in 1988	2,634,419 tonnes

Preliminary estimates are that approximately 71 million tonnes of solid waste will be generated in Metro over the 20-year period 1991-2010. The work to date has indicated there are proven, as well as pilot and experimental approaches available to Metro for consideration in the development of its waste management system.

Recognizing the complexity and scheduling of the environmental assessment planning and approvals process, Metro must do all it can now to establish programs and implement the construction of new facilities that begin early to deal with the management of solid waste.

THE PRIORITY OF WASTE MANAGEMENT PROGRAMS AND FACILITIES

The approach presented in Discussion Paper 7.1 reflects the input from Metro Councillors, the Multistakeholder Committee and others regarding how waste can and should be managed in the future. The draft waste management policies reflect that input and describes how the development of alternative systems should have full regard for the following approaches listed in their order of priority:

No. 1 - Reduce the quantity of material becoming solid waste
No. 2 - Reuse material for the same purpose
No. 3 - Recycle, including material recovery
No. 4 - Compost
No. 5 - Incinerate with energy recovery/landfill
(residues of the above approaches)

CONSIDERATIONS IN THE DEVELOPMENT OF ALTERNATIVE SYSTEMS

It is important to identify differences and assess trade-offs associated with the above priorities. For example, two of the alternative systems presented in this Discussion Paper assume that incineration is preferable to landfill. Therefore, the waste which cannot be managed by higher priority approaches and which is combustible should be managed by incineration rather than landfill. On the other hand, one alternative system does not include incineration and, as a result, up to 45% of waste requiring management was estimated to be landfilled over the 20-year period. A recommendation has not been made in the Discussion Paper regarding the priority of approaches with respect to landfill and incineration. In this regard, public debate should be stimulated by the release of this document and reflected in the solid waste management policies that are considered by Metro Council.

Another important consideration in the development of Metro's solid waste management system could be to use certain facilities for a defined term of less than 40 years. One major intent of Metro's waste management planning is to change the quantity and nature of waste requiring management. The reduction of certain types of waste and the focus on current and environmentally sensible approaches could mean that the possible use of incinerators (and landfills) would change over the planning period. It is entirely possible then, that incineration, at least for certain materials such as wood and tires, would be utilized for a limited period until other approaches become available or until combustible wastes can be better managed by other means.

Public attitudes and provincial and Metro objectives simply will not allow a landfill-dependent or landfill-dominated waste management system no matter how safe and economic the landfills selected are. The siting and establishment of landfills and energy from waste (EFW) incineration facilities will be extremely difficult. Their implementation could be facilitated if there were a demonstrated commitment by Metro to assume a leadership role among Ontario municipalities in the implementation of waste reduction and reuse programs. Metro could also sponsor research and development in new ways to reuse wastes. Such Metro initiatives could be essential in order for Metro to receive approvals at the earliest possible time.

THE PLANNING AND IMPLEMENTATION PROCESS

A necessary part of addressing the waste management problem is to fully satisfy the requirements of the Environmental Assessment Act (EAA). This requires that every step of the planning process, including the rationale for all decisions, be fully documented. Metro's SWEAP process has recognized these commitments and a comprehensive program of study and documentation has been outlined. The planning process, which was described in the "Appraisal Study", has been, and will be, refined as public consultation develops and the necessary technical studies are completed.

BEYOND THE TWENTY YEAR PLANNING PERIOD

Metro's waste management planning process is not limited to addressing the current problem. Rather, it is intended to consider beyond the 20 to 25-year planning period and examine the objectives and priorities that will shape the long-term approach to managing solid waste. The Discussion Paper begins the development of the long-term approach by outlining seven objectives for review and consideration. The philosophical basis of the objectives is one of a conserver society. In this context, the long-term objectives are as follows:

- the establishment of solid waste management programs and facilities by Metro that follow the guiding principle of sustainable development. This will require Metro to critically evaluate all activities within its jurisdiction (and perhaps beyond) that contribute to the generation of waste, to ensure that the needs of the present are met without compromising the ability of Metro's future generations to meet their own needs,

- the development of a conservation strategy that emphasizes resource conservation and resource enhancement,

- the establishment of long-term programs and facilities that contribute to the evolution of a zero or near-zero waste society. The effects of waste reduction and ecologically sustainable approaches to waste management should result in the greatly extended use of materials, energy and reusable residuals,

- the encouragement by Metro through implementation of these stated long-term objectives, of programs, initiatives and emerging technologies that assist Metro in reaching its objectives. Metro's direct support for research and development, pilot programs and reasonable experimentation should serve to assist in the development of programs and technologies necessary to address the principles outlined herein,

- the development of opportunities for all sectors of society to participate in the long-term waste management planning process. Metro should sponsor and actively encourage, through public awareness and education, these opportunities for participation,

- the establishment of solid waste management facilities in the relatively short 20-year period which recognize and consider the longer term objectives. This includes emphasis on waste reduction as the primary method of waste management and the eventual elimination of incineration and landfill as approaches to managing Metro's waste, and

- the development by Metro of "net materials accountability" whereby industrial manufacturers of material are charged with the responsibility of ensuring that production practices result in the least quantity of waste possible being generated.

WASTE MANAGEMENT SYSTEM COMPONENTS

There are many different types of programs and technologies (e.g., system components) potentially available to manage Metro's solid waste. Discussion Paper 7.1 and earlier SWEAP Discussion Papers describe these various system components. In developing alternative systems, the following types of approaches were considered:

1. Reduction & Reuse (not requiring direct management by Metro)

    - Reduction by:
        - public education*
        - packaging changes
        - backyard composting*
        - procurement policies*
        - incentives
        - industrial in-house changes

* Metro is currently actively involved in these

- Reuse, including:
    - changes in household practices
    - commercial and industrial audits
    - container deposits

2. Recycling (requiring direct management by Metro)

- Recycling, including:
    - material sorting facilities
    - blue box program
    - wet/dry collection
- Composting, including:
    - leaf composting
    - dedicated organic waste composting
    - wet waste composting
    - mixed waste composting

3. Disposal (requiring direct management by Metro)

- Incineration, including:
    - with energy recovery
    - mixed waste feed
    - feed restricted to combustible residuals from higher priority approaches
    - production of RDF
    - residuals used as fuel
- Landfill, including:
    - mixed waste
    - restricted to residuals from higher priority approaches
    - restricted use

DEVELOPMENT OF ALTERNATIVE WASTE MANAGEMENT SYSTEMS

The product of Discussion Paper No. 7.1 is the identification of three "Alternative" waste management systems which describe different combinations of programs and facilities (i.e., system components) that can be used to manage solid waste generated in Metro. The three alternatives were developed having regard for the following considerations:

- the quantity and type of solid waste requiring management for the next 20 to 40 years,
- the priorities and guiding principles established by Metro Council, identified by the Province and suggested through the SWEAP public consultation process,
- Metro and Provincial waste diversion objectives. Provincial objectives will require that by 1992, 25% and by the year 2000, 50% of total waste generated be diverted from landfill and incineration Metro has endorsed a landfill diversion objective of 30% by 1992,
- the types of waste management programs and technologies potentially available to develop Metro's long-term system. The list of potential approaches includes some which have yet to be proven at a Metro size and scale,
- "system screening factors" which were used to develop a long list of potential systems, and
- "system comparative factors" which were used to evaluate alternatives from the long list of potential systems.

Discussion Paper No. 7.1 also includes a list of factors that could be used to develop criteria, that in turn could be used to evaluate specific waste management programs and technologies considered for implementation by Metro.

THE THREE ALTERNATIVE SYSTEMS

Two of three alternatives presented include incineration (energy from waste - EFW) and all three were developed to ensure that the effect of waste reduction programs was maximized.

A comparison of the three alternative systems, using the year 2000 as an example, is provided in **Table 1** and the attached graphic **Figure 1**. The alternative systems are:

- Alternative System No. 1 - high diversion without EFW
- Alternative System No. 2 - high diversion with moderate EFW
- Alternative System No. 3 - moderate diversion with high EFW

The evaluation and selection of Metro's preferred waste management system will follow the public and government agency review of Discussion Paper No. 7.1.

THE NEXT STEPS

The next steps in the SWEAP process require a significant commitment from Metro. The following steps are outlined in Discussion Paper No. 7.1 as initiatives that Metro should undertake as part of the SWEAP planning and implementation process:

- Metro should continue with, and expand where necessary, the Public Participation Program including public education,

- the SWEAP Technical Group should continue to co-ordinate all activities directed to establishing waste management programs and facilities. It should be the task of this Group to ensure that the long-term waste management system is developed in an orderly and rational manner,

- Metro should consider, modify if necessary, and approve Solid Waste Management Policies. Draft policies were provided by the Commissioner of Works to Works Committee in January 1989. Those policies are extremely important to developing a master plan and would represent Metro Council's statement on waste management,

- the site search process for the proposed new 190 TPD prototype compost facility and for additional compost facilities should be completed. It is essential that Metro begin to establish this type of facility as part of its system development process,

- the waste composition study should be continued. Available secondary data have been adequate only to assist generally in the planning of systems and a possible range of facility sizes,

- a site selection approach, and evaluation criteria to find preferred locations for recycling, composting and energy-from-waste (EFW) facilities, should be finalized for review by the public and Metro Council. Following this, the facility site searches should be completed. This work should be in full swing by mid-1990,

- the prototype materials recovery facility should be established and a site search begun to identify locations for future materials recovery facilities,
- the role (e.g., numbers, size, type) of landfill in Metro's long-term system should be examined. This is an important part of the landfill site selection and system development process,
- Metro's long-term landfill site search process should continue and one or more landfills should be established, and
- Metro should continue with proposed pilot wet collection program.

RECOMMENDATION

It is recommended that Discussion Paper No. 7.1 be distributed for public and government agency review and then be subject to a further review through technical/planning sessions with Metro Council.

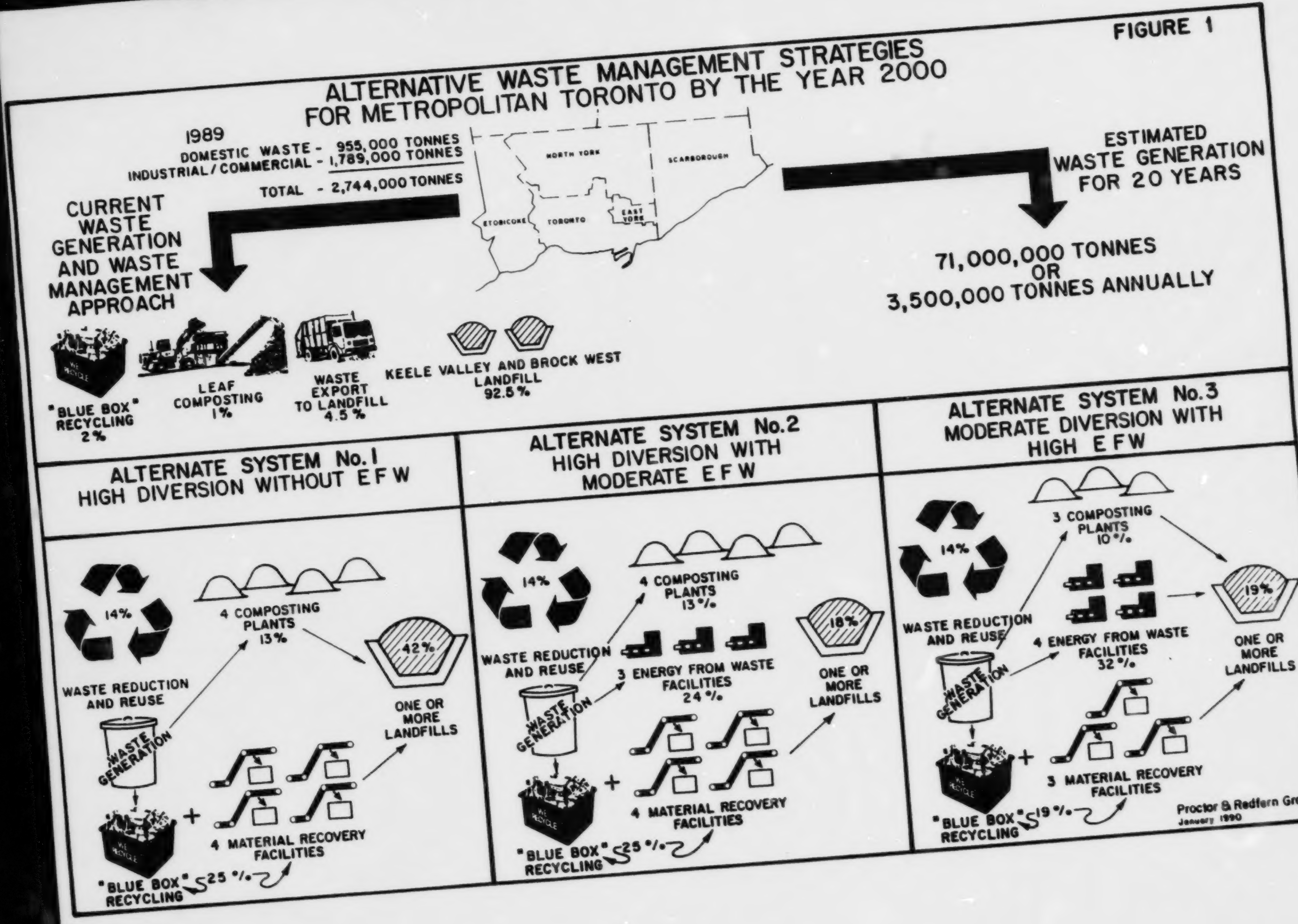
EXECUTIVE SUMMARY - Continued

TABLE 1
A COMPARISON OF ALTERNATIVE SYSTEMS BY PERCENTAGE OF TOTAL WASTE HANDLED
(YEAR 2000)

System Component	Alternative No. 1	Alternative No. 2	Alternative No. 3
REDUCTION AND REUSE - Public Education - Packaging Reduction - Industrial In-House Changes - Backyard Composting - Procurement Policy - Incentives - Container Deposits	14%	14%	14%
RECYCLING - Blue Box - Separate Collections - Industrial Audits	25%	25%	19%
COMPOSTING - Leaf - Dedicated - Wet/Dry - Mixed	13%	13%	10%
OTHER - Sewage Sludge - Tire and Wood Waste as fuel	5%	6%	6%
ENERGY FROM WASTE	0%	24%	32%
LANDFILL	42%	18%	19%
Total	**100%**	**100%**	**100%**

Alternative System No. 1 - high diversion without EFW
Alternative System No. 2 - high diversion with moderate EFW
Alternative System No. 3 - moderate diversion with high EFW

FIGURE 1



ALTERNATIVE WASTE MANAGEMENT STRATEGIES FOR METROPOLITAN TORONTO BY THE YEAR 2000

1989
DOMESTIC WASTE - 955,000 TONNES
INDUSTRIAL / COMMERCIAL - 1,789,000 TONNES
TOTAL - 2,744,000 TONNES
CURRENT WASTE GENERATION AND WASTE MANAGEMENT APPROACH
NORTH YORK
SCARBOROUGH
ETOBICOKE
TORONTO
EAST YORK
ESTIMATED WASTE GENERATION FOR 20 YEARS
71,000,000 TONNES OR 3,500,000 TONNES ANNUALLY
WE RECYCLE
"BLUE BOX" RECYCLING 2%
LEAF COMPOSTING 1%
WASTE EXPORT TO LANDFILL 4.5%
KEELE VALLEY AND BROCK WEST LANDFILL 92.5%
ALTERNATE SYSTEM No.1
HIGH DIVERSION WITHOUT E F W
14%
WASTE REDUCTION AND REUSE
WASTE GENERATION
4 COMPOSTING PLANTS 13%
42%
ONE OR MORE LANDFILLS
4 MATERIAL RECOVERY FACILITIES
"BLUE BOX" RECYCLING 25%
ALTERNATE SYSTEM No.2
HIGH DIVERSION WITH MODERATE E F W
14%
WASTE REDUCTION AND REUSE
WASTE GENERATION
4 COMPOSTING PLANTS 13%
3 ENERGY FROM WASTE FACILITIES 24%
18%
ONE OR MORE LANDFILLS
4 MATERIAL RECOVERY FACILITIES
"BLUE BOX" RECYCLING 25%
ALTERNATE SYSTEM No.3
MODERATE DIVERSION WITH HIGH E F W
14%
WASTE REDUCTION AND REUSE
WASTE GENERATION
3 COMPOSTING PLANTS 10%
4 ENERGY FROM WASTE FACILITIES 32%
19%
ONE OR MORE LANDFILLS
3 MATERIAL RECOVERY FACILITIES
"BLUE BOX" RECYCLING 19%
Proctor & Redfern Group
January 1990

TOWARDS A SOLID WASTE MANAGEMENT MASTER PLAN
A STATUS REPORT ON METROPOLITAN TORONTO'S PLANNING PROCESS

Discussion Paper No. 7.1

DECEMBER 1989

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1.0 INTRODUCTION

1.01 Purpose of this Discussion Paper

In 1986, Metro decided to prepare a new solid waste management master plan that fully addresses the requirements of the Environmental Assessment Act (EAA).

Considerable technical analysis, public consultation and administrative work has been undertaken since that decision was taken resulting in the many reports, discussion papers and newsletters prepared and referenced in this Paper.

This planning work is leading to the preparation of a master plan document that will form the basis of a submission under the EAA (and possibly other legislation) for approval to proceed with a new solid waste management system.

PURPOSE OF THIS DOCUMENT

This Discussion Paper represents an important step in the development of a long-term solid waste management system for Metro and provides the basis from which public consultation and subsequent technical activities should be undertaken. In this regard, it is important that participants in the SWEAP process understand the purpose and intent of this Discussion Paper which is:

- to consolidate and summarize information prepared by Metro and its consultants. A comprehensive data base is available on the quantities, sources and types of solid waste currently generated in Metro. Data on the composition of solid waste requiring future management are sufficient for the purposes of this planning exercise. However, more waste composition data are required as the planning process develops and programs and facilities proceed to implementation,

- to identify the study area and the waste management needs and opportunities within that study area. After a great deal of discussion, Metro Works staff propose at this reporting stage that Metro be the study area and, therefore, the quantity of solid waste generated in Metro by both the public and private sectors be the "problem" for waste management planning purposes. It is expected that public review of this Discussion Paper will also address this matter,

- to respond to the waste diversion objectives established by Metro Council and by the Province. Metro's objectives are to divert waste from landfill whereas Provincial objectives are to divert waste from landfill and incineration,

- to develop for consideration by Metro Council, solid waste management policies as well as long-term objectives. Metro Works and consultants prepared and suggested draft policies and objectives for consideration by Metro Council. Please refer to Appendix F for the full text. These draft policies were presented to Metro Works Committee in January 1989,

- to establish philosophical and practical objectives to form the basis of system, program and facility development. To do this properly requires the development of a rational, understandable and fair planning process that complies with the EAA, other relevant provincial legislation, public and government agency input and most importantly, the needs and priorities of the Metro community,

- to outline the basis for establishing a 40-year or longer solid waste management master plan. The need for an ambitious plan that strives towards zero waste generation and sustainable development is represented in a set of philosophical statements that are included in this Paper,

- to evaluate alternative approaches to manage solid waste over the next 20 years and longer. Three alternative waste management systems were developed and are discussed in this Discussion Paper, and

- to identify evaluation factors that will be used in subsequent Metro studies leading to the development of the solid waste management master plan. System screening factors were used to develop the alternative systems. System comparative factors will be used to evaluate the alternative systems developed.

Given the preliminary nature of this document, several points must be stressed. Firstly, not all analysis has been completed. At this date, some data requirements, such as the detailed analysis of the composition of the waste stream to be managed, have yet to be completed. Other requirements have only received "first cut" analysis. Thus, this report cannot be said to be complete; rather it is essentially a progress report in which conclusions are drawn based upon knowledge gained to date.

Secondly, it must be stressed that the conclusions reported in this document are subject to revision as the work program proceeds and new information becomes available. The planning towards SWEAP is an iterative process.

Thirdly, the final master plan document may not follow exactly the same format as this preliminary plan report.

Fourthly, given the information available, the level of detail in many of the sections of this report requires expansion for the final document. Thus, this report may speak in terms of "one or more landfills", without any location named; the master plan documents will likely specify exactly how many landfills are being recommended over the planning period and where these facilities should be sited.

Despite these admonitions, it is considered that this Discussion Paper will help focus attention on the analysis and work already carried out, the work yet to be done in the planning process, and how the various components of the long-term system may interact.

Finally, it should be noted that this report reflects comments from the public received through the public participation process as well as from Metro Councillors through special working sessions held in July and October, 1989. Metro Council has not, however, approved the contents of this Discussion Paper.

1.02 Metro's Long-Term Waste Management Objectives

An important activity in the preparation of the Discussion Paper was to review the approach, philosophy and preliminary findings at two Metro Council workshops. Comments received at those sessions emphasized the need for Metro to consider long-term objectives as well as short-term needs and objectives.

The establishment of waste management programs and facilities by Metro will have full regard for the long-term (after the year 2010) objectives. Facility capacities, operating periods and supporting programs will be developed recognizing that many types of facilities developed for the short-term planning period (1991-2010) could be transitional and eventually be replaced by new, more environmentally sensitive approaches, or not be required at all. There may not be a need in the future for certain types of waste management facilities requires in the early years of the plan if waste reduction initiatives eliminate certain types of material from the waste stream.

The philosophy of a conserver society should guide the development of Metro's long-term waste management objectives. These objectives are:

- the establishment of solid waste management programs and facilities by Metro will follow the guiding principle of sustainable development. This will require Metro to critically evaluate all activities within its jurisdiction (and perhaps beyond) that contribute to the generation of waste, to ensure that the needs of the present are met without compromising the ability of Metro's future generations to meet their own needs;

- the development of a conservation strategy that emphasizes resource conservation and resource enhancement;

- the establishment of long-term programs and facilities that contribute to the evolution of a zero or near zero waste society. The effects of waste reduction and environmentally sustainable approaches to waste management will result in the greatly extended use of materials, energy and reusable residuals;

- the encouragement by Metro, of programs, initiatives and emerging technologies that will assist Metro in reaching its objectives. Metro's direct support for research and development, pilot programs and reasonable experimentation will serve to assist in the development of programs and technologies necessary to address the principles outlined herein;

- the development of opportunities for all sectors of society to participate in the long-term waste management planning process. Metro will sponsor and actively encourage, through public awareness and education, these opportunities for participation;

- the establishment of solid waste management facilities in the relatively short 20-year period which will recognize and consider the longer term objectives. This includes emphasis on waste reduction as the primary method of waste management and the eventual elimination of incineration and landfill as approaches to managing Metro's waste;

- the development by Metro of "net materials accountability". Industrial manufacturers of material will be charged with the responsibility of ensuring that production practices result in the least quantity of waste possible being generated.

1.03 Study Area and Planning Period

In terms of waste to be managed as stated before, the study area is defined as Metro. In terms of potential waste management facility siting opportunities, the study area is defined as Metro and surrounding Regions.

The SWEAP process began by considering that the waste to be managed was comprised of municipally and privately-collected waste from Metro and the Regional Municipalities of York and Durham. Since that time, both York and Durham Councils have decided to not participate directly in the SWEAP process. Both Regions have since undertaken to prepare their own solid waste management plans. It must be noted, however, that Metro is obligated through its agreements with the Regions to:

i) accept an agreed upon allotment of waste from the Towns of Pickering and Ajax in the Region of Durham as long as Metro is operating a landfill site in Durham Region, and
ii) accept York Region waste to the year 2003.

The alternative waste management systems developed in this Discussion Paper deal only with Metro's waste, although landfill capacity targets will account for Metro's waste as well as any obligations for waste disposal from any other jurisdiction.

In terms of the planning period used in this Discussion Paper, alternative waste management systems and the means to achieve them have been developed for the 20-year period 1991-2010. It is fully recognized, however, that proper planning must include the setting of longer term targets. Thus, a waste management philosophy has been developed for the period 1991-2030, in effect providing a 40-year planning period. As part of proper waste management system planning, detailed reviews should be undertaken at least every five years. Therefore, over time, the targets for the second 20-year period and the means to achieve them will evolve in greater and greater detail.

1.04 Contents of This Document

This Discussion Paper is comprised of eight sections. Section 2 describes the legislative and jurisdictional issues under which solid waste management and its planning operate in Ontario generally and for the study area in particular. Section 3 describes the planning process, known as SWEAP (Solid Waste Environmental Assessment Plan), through which Metro is undertaking this solid waste management planning exercise. A discussion of the public participation process is also provided.

In Section 4, the waste stream that must be managed is described and a preliminary attempt is made to forecast how much and what type of waste will fall under the plan over the planning period. Section 5 reviews the existing waste management system in Metro, including the remaining capacity of present facilities. Sections 4 and 5 essentially represent what is known at this stage about the supply and demand for waste management in Metro. This sets the basis for the need (or rationale) for the new plan under preparation.

Section 6 presents a description of potential solid waste management system components.

On the basis of what has been learned thus far, as reported in the first six sections of this report, Section 7 presents the preliminary master plan, i.e., what general plans, programs and facilities may be best suited (at this juncture) to managing Metro solid waste over the planning period. Section 8 describes what must be accomplished before a final master plan document can be prepared and, importantly, what steps that should be taken in the interim to ensure that facilities are available to manage Metro's waste until such time as new facilities and programs can be implemented. Key appendices bound into this document to help the reader are:

- Metro's Proposed Waste Reduction and Recycling Plan
- Waste Management Components and Opportunities
- Metro Council Policy Statement and MOE Statements on Diversion Goals
- Metro Works Department Preliminary Solid Waste Management Policies

A glossary of solid waste management terms is presented in Appendix I.

2.0 THE ENVIRONMENTAL ASSESSMENT PROCESS

2.01 The Environmental Assessment Act

The Environmental Assessment Act (EAA) was enacted in 1975 and is one of two major provincial statutes governing environmental approvals of waste management matters in Ontario. (The second major piece of legislation is the Environmental Protection Act (EPA), discussed in Section 2.04.) Regulation 205/87 is the major implementing regulation under the EAA.

The stated purpose of the EAA is "... the betterment of the people of the whole or any part of Ontario for the protection, conservation and wise management in Ontario of the Environment". The actual purpose of the statute is to require a thorough "environmental assessment" of an "undertaking" to be carried out as part of the planning and development of the undertaking, prior to receiving an approval under the EAA or any other statute requiring approvals, such as the EPA.

The EAA applies to undertakings by the provincial government, "public bodies" and municipalities, unless the undertaking or the proponent is specifically exempted by a regulation or an order made under the Act. The Act may also be applied, by regulation, to private sector undertakings on an ad hoc basis.

In the context of Metro, Regulation 205/87 provides that all municipal undertakings with a value of approximately $3.5 million or less are exempt from the Act. Regulation 205/87 also provides that a waste disposal site for which a certificate has been issued under S.31 of the EPA (i.e., a site that is alleviating an emergency situation), and transfer stations for domestic waste that use portable containers are both exempt from the Act, unless the Minister of the Environment decides a hearing would be required prior to the issuance of a certificate of approval under the EPA for such a facility.

Where an exemption from the statute is sought, the Minister of the Environment may refer such requests to the Environmental Assessment Advisory Committee for its recommendation.

The term "undertaking" as defined in EAA, is applied not only to individual facilities costing more than the $3.5 million but also to a plan or program that may include one or more facilities. Thus, a solid waste management plan such as the Metro SWEAP process, which is a solid waste management master plan, depending on the cost required to implement it, could be the subject of an environmental assessment under the EAA if it were approved or adopted by Metro Council.

If the environmental assessment of the plan is carried out in a manner that meets, simultaneously, the EAA requirements for individual facility components (i.e., landfill, composting, etc), the environmental assessment of the solid waste management plan could be considered as an environmental assessment for each of the facility components and simultaneous approval of the plan and the component facilities on a non-site specific or generic basis could be sought.

In practical terms, the EAA works on the basis that a proponent, such as Metro, cannot proceed with an undertaking unless:

- an environmental assessment of the undertaking has been submitted to the Minister of the Environment;
- the environmental assessment has been accepted by the Minister; and
- the Minister has given his approval to proceed with the undertaking, with or without conditions.

Although the proponent may not proceed with an undertaking without the Minister's approval under the EAA, the proponent can conduct planning and engineering feasibility studies at its own risk and can option land for a waste management site at any time prior to receiving the Minister's approval.

The EAA specifies minimum requirements for the contents of the environmental assessment document, as follows:

(a) a description of the purpose of the undertaking,

(b) a description of and a statement of the rationale for: the undertaking; the alternative methods of carrying out the undertaking; the alternatives to the undertaking,

(c) a description of:

  (i) the environment that will be affected or that might reasonably be expected to be affected, directly or indirectly
  (ii) the effects that will be caused or that might reasonably be expected to be caused to the environment
  (iii) the actions necessary or that may reasonably be expected to be necessary to prevent, change, mitigate or remedy the effects upon or the effects that might reasonably be expected upon the environment

by the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking, and

(d) an evaluation of the advantages and disadvantages to the environment of the undertaking, alternative methods of carrying out the undertaking and the alternatives to the undertaking.

The requirement to consider alternatives to the undertaking, which has been interpreted to mean "all reasonable alternatives", is one of the most important features of the EAA. For example, if a proposed undertaking were a landfill, it would be necessary to consider not only the landfill itself, but also alternative techniques of solid waste management (e.g., incineration, composting, etc.). It also refers to "alternative methods"; for example, alternative methods of implementing each type of technique (e.g., for incineration: mass burn, refuse derived fuel (RDF), fluidized bed, pyrolysis, etc.).

This environmental assessment analysis is made very thorough by reason of the definition of environment found in the EAA Section 1(c):

> "environment means,
>
> (i) air, land or water
> (ii) plant and animal life, including man
> (iii) the social, economic and cultural conditions that influence the life of man or a community
> (iv) any building, structure, machine or other device or thing made by man
> (v) any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from the activities of man or
> (vi) any part or combination of the foregoing and the inter-relationships between any two or more of them
>
> in or of Ontario"

After the environmental assessment is submitted to the Minister, it is subject to review by the Ministry of the Environment (MOE) and other affected ministries and agencies, including selected Federal departments and public bodies. The Environmental Assessment Branch of MOE co-ordinates this review process and also evaluates and offers advice to the Minister as to whether the components of the document meet the Act's requirements.

After submission of the environmental assessment documentation, the Minister is required to give notice that it has been received and its review completed. At this point, any person may request a hearing on the acceptance of the environmental assessment document or the approval to proceed with the undertaking with or without conditions. The Minister must grant such a request and refer the matter to the Environmental Assessment Board (EA Board) an independent tribunal appointed by cabinet, unless the request is considered frivolous or vexatious or unnecessary or likely to cause undue delay.

A public hearing may proceed under the EAA or under other provincial acts; the Consolidated Hearings Act allows for the establishment of a Joint Board for hearing a case where an undertaking requires approvals under more than one act - rather than go through several hearings, the proponent can apply for a single hearing before a joint board.

The hearing is conducted along the lines of court proceedings, with witnesses appearing for each "side". Rules for presentation of evidence are much less formal than those of a court.

A decision of the EA Board is final, subject to any application to the courts for judicial review and unless the decision is varied or substituted for, or a new hearing is required to be held by the Lieutenant Governor in Council.

Although the EAA contemplates that approval of the undertaking will be given in the first instance by the Minister of the Environment, experience indicates that for solid waste management matters, public hearings play an important role.

Prior to the enactment of the EAA, solid waste management master plans were undertaken as technical and economic analyses directed at one or more particular objectives (e.g., obtaining new or additional landfill capacity or an incinerator). The process did not require the complete investigation of all reasonable alternatives to the objective or the effects of the objective on the environment as it is broadly defined in the EAA.

Metro decided to proceed with a planning process that would meet the requirements of the EAA for a number of reasons:

- matters affecting the environment have been given a high priority by the provincial government;

- the public is very sensitive to solid waste management issues and will insist that all alternatives be investigated prior to selecting a solid waste management program;

- municipalities that have not rigorously followed the approach required by the Act from the outset have found that, after experiencing considerable expense and delays, they are ultimately required to comply in one way or another.

The goal of SWEAP is the development of a solid waste management master plan and master plan documents, that will form the basis for approvals under the EAA of specific projects identified in the plan. These individual projects would go forward as "undertakings" under the Act.

The evaluation of alternatives is considered the cornerstone of the EAA process. For waste management master plans, the possible alternative methods of carrying out the undertaking include: reduction, reuse, recycling, recovery, composting, energy-from-waste, refuse-derived fuel, landfilling and export. For each such alternative, alternative technologies and sites must be examined. For example, if a plan proposes a specific incinerator technology, the proponent must show that various alternative incinerator technologies were considered and must give the rationale for the one selected.

Pre-submission consultation including public participation and liaison with government review agencies in the development of the master plan document is considered by MOE to be essential to carrying out the planning process required by the EAA. MOE has stated that effective consultation improves the end product, which will then come to reflect the collective knowledge, experience, values and judgment of all parties affected.

2.02 The Environmental Protection Act

The second major piece of legislation relating to waste management undertakings is the EPA of Ontario, in particular Part V ("Waste Management"). It and Regulation 309 under it contain most of the legal provisions that are relevant to the environmental regulation of solid waste management matters by the province. This Act is a facility licensing process, as compared to the EAA's planning process.

Section 27 of the EPA states that,

> "no person shall use, operate, establish, alter, enlarge or extend: (a) a waste management system, "or" (b) a waste disposal site, unless a certificate of approval or provisional certificate of approval, therefore, has been issued by the Director and except in accordance with any conditions set out in such certificate".

A waste management system is described in the EPA as "all facilities, equipment and operations for the complete management of waste, including the collection, handling, transportation, storage, processing and disposal thereof, and may include one or more waste disposal sites," (S.24 (f)).

A "waste disposal site" is broadly defined in the EPA to mean "any land or land covered by water upon, into, in or through which, or building, or structure in which, waste is deposited or processed and any machinery or equipment or operation required for the treatment or disposal of waste" (S.24 (e)).

According to Regulation 309 (as amended), the collection activity of each area municipality is a "municipal waste management system" and the receipt and disposal of the collected waste is also a "municipal waste management system". Each activity would, therefore, appear to require a certificate under the EPA. It would appear that Regulation 309 applies to the collection activity and the part of the disposal activity that involves the transportation of waste from the transfer stations to the place of disposal.

Subject to any exemption given under the EPA or any emergency approvals (S.31), there is a mandatory requirement under the Act (S.30 (i)) for a public hearing in connection with any application for a Certificate of Approval for the "use, operation, establishment, alternation, enlargement or extension of a solid waste disposal site".

3.0 THE SWEAP PROGRAM AND PROCESS

3.01 Metro's Statutory Authority for Solid Waste Management

The Municipality of Metropolitan Toronto Act (the "Metro Act") established a two tier municipal structure for Metro. The upper tier is the Municipality of Metropolitan Toronto and its Council and the lower tier is comprised of the individual municipalities ("area municipalities") of the Cities of Toronto, North York, Etobicoke, Scarborough and York and the Borough of East York.

Within the boundaries of Metro, according to the Metro Act, the collection of municipal solid waste is the responsibility of the area municipalities while the disposal of that waste is the responsibility of Metro. Metro currently owns and operates seven transfer stations, two landfills (not within Metro boundaries), a fleet of trucks to transfer waste from the transfer stations to the landfills, 10 household hazardous waste depots, a leaf composting facility and a "toxics taxi" service.

Under the Municipal Act, area municipalities have the power to pass by-laws to establish and maintain a system for the "... collection, removal, and disposal of garbage or of garbage and other refuse or of ashes, garbage and other refuse" and for contracting with any person for such work. They may also erect and maintain, with the approval of the Ministry of Health, buildings, machinery and plants necessary for such a system. Funds, through the issuance of debentures, may be borrowed and by-laws may be passed to impose charges against the "ratable property" in the municipality to pay the costs associated with borrowing.

Each of the area municipalities within Metro has, under the Municipal Act, passed by-laws which regulate the manner in which solid waste will be collected.

The Municipal Act appears to permit a local municipality to require the separation of garbage at source.

The Metro Act permits Metro to "erect, maintain and operate buildings, structures, machinery or equipment for the purposes of receiving, dumping and disposing of waste". The area municipalities are specifically excluded from exercising these powers without the approval of Metro Council. Metro took over this authority from the area municipalities within its boundaries in 1967 and assumed ownership and operation of the facilities.

The Metro Act permits Metro to acquire (including expropriation) and use land for receiving, tipping and dumping waste in any municipality either within or outside of the Metro boundaries. The land may not be acquired without the approval of the affected municipality; if the affected municipality refuses to give its approval, Metro may appeal to the Ontario Municipal Board (OMB). It should be noted that while any municipality in Ontario may expropriate land, Metro has been specifically given the power to expropriate land in another municipality for the receiving, dumping and disposal of waste (with approval of the local municipality or OMB as the case may be).

Regulations governing the use of waste disposal facilities are adopted by Metro Council. These facilities include transfer stations, incinerators and landfills as well as any facilities to recover resources or products. Metro is empowered under the Metro Act to carry on all ancillary activities associated with such facilities, including "... recovering, manufacturing, producing, supplying, selling or distributing from domestic or industrial sewage or waste any product, resource, commodity, electrical power or energy, hot water or steam, and for such purposes may...carry on investigations, experiments research or development; construct and maintain pipes, apparatus, and equipment... and acquire any patent or license..."

3.02 Events Leading Up To Establishment of SWEAP

SWEAP is the acronym for Metro's Solid Waste Environmental Assessment Plan planning process.

In February 1986, Metro Council approved a report from the Commissioner of Works recommending that a Steering Committee be established to "explore options and resolve terms of reference for an updated waste management master plan and to provide cost estimates." This Committee was to comprise representatives of Metro, Durham, York and MOE.

In May 1986, Metro Council approved the carrying out of the Solid Waste Master Plan Study and the Durham Region landfill search in accordance with the requirements of the EAA. An Appraisal Study was to be undertaken by consultants to establish the manner in which Metro should proceed. The study and the search were to proceed concurrently with an approvals process that "should result in the next Durham Landfill being phased into service in 1989 approximately, as the existing Brock West Landfill is phased out of service".

Metro had originally planned to use the Brock North and Brock South sites for landfill following the closure of Brock West. Provisional certificates of approval were received for these sites to allow waste disposal after public hearings in the mid-1970's. The use of these sites as landfills is included in the Metro - Durham agreement that covers Brock West. Brock North was used by Metro very briefly in the late 1970's, but this was discontinued because of budget constraints.

The Appraisal Study was received by Metro Council in February, 1987. The study was prepared with a view to assessing the procedures necessary to be implemented in order to conform with the requirements of the EAA. In addition, the study addressed the rationale for investigating different waste management systems and recommended that landfill be a component of any long-term waste management plan. The study also addressed the scheduled closure of the Brock West Landfill and indicated that to ensure an orderly solid waste management system for the interim period, during which the planning for new facilities is being undertaken, interim landfill capacity could be established at Brock North or South or both, if technically feasible.

The Appraisal Study outlined a five-year work program, the first four years of which would be utilized to prepare the supporting documentation and applications necessary to comply with the terms of the EAA. The environmental assessment hearings were envisioned proceeding in the fifth year of the process.

In March 1987, Metro Council approved recommendations that "authority be granted....for funding of studies required to develop a Waste Management Master Plan"; that a program of recycling initiatives be authorized; and that a search for landfill facilities be conducted.

3.03 Purpose of SWEAP

SWEAP is an undertaking designed to produce a long-term waste management master plan for Metro for a period of 20 to 40 years.

The master plan will identify the most acceptable systems for the handling, reduction, reuse, recycling, transportation, processing and disposal of solid waste generated in Metro and solid waste from other jurisdictions for which Metro has outstanding obligations. The plan will include a comprehensive review of all waste management options and establish a mix of these alternatives that takes into account economic, financial, social, cultural, technical, land-use planning and natural environmental factors. The plan will also identify sites for the various waste management facilities.

In early 1989, the Chairmen of the regional municipalities of Metro, York, Durham, Halton and Peel decided to form a Greater Toronto Area ("GTA") waste management group to achieve an advanced solution for the treatment and disposal of solid waste in a socially and environmentally acceptable manner for the entire area. In April 1989, Metro Council adopted a recommendation to continue with the SWEAP process, public participation and preparation of a Metro master plan and to co-ordinate the SWEAP and GTA solid waste management initiatives until "the GTA Authority assumes responsibility for and produces an approved multi-regional master plan, or provides approved facilities and dates of availability that are satisfactory to Metro".

3.04 SWEAP Activities and the EAA

Metro has determined that the development of a long-term solid waste management plan should be undertaken within the spirit and intent of the EAA. This is consistent with the current position of the Minister of the Environment who has recently announced that all Waste Management Master Plans shall be designated under the EAA.

Although the EAA leads to more complexity and public involvement in the process than would otherwise be required, it should produce better focused, more acceptable decisions in the final stages and, ultimately, savings in time and cost.

3.05 The SWEAP Process

SWEAP is comprised of a multi-year work program designed to develop a solid waste management program for Metro capable of:

- managing solid waste for a minimum twenty-year period and providing planning direction for a forty-year period,
- adapting to changes in public attitudes, technology, and solid waste generation, and
- ensuring public health and safety and protecting the natural environment.

The work program is based on the need to produce the required documentation and prepare applications for necessary approvals. Hearings may be required under the various statutes governing solid waste management and land use planning matters.

Four types of work activity have been designed into the SWEAP process. These are technical activities (relating to the evaluation, siting and design of solid waste management facilities); legal/jurisdictional activities (relating to policy matters, government regulations, jurisdictional matters, approvals and hearing strategy and legal advice on miscellaneous issues); project management and co-ordination activities; and public participation activities (relating to public involvement in the process, thereby maximizing the chances for successful project implementation).

3.06 SWEAP Activities to Date

The SWEAP process commenced in March, 1987. In the first two years of the process just completed, progress has been made on all issues and fields of activity. Public participation activities completed over the first two years of the program are discussed later in this section.

A number of reports and discussion papers have been produced as a result of work undertaken to date. These are listed in Appendix "A".

3.07 Origins of the Public Participation Process

Although the EAA does not specifically require public input during the development of a waste management master plan, public consultation is basic to the process. The MOE's "A Citizen's Guide to Environmental Assessment" states that:

> "the Act is intended to promote good environmental planning and ensure that the public has the opportunity to comment on projects which may affect them."

MOE's 1987 report "Guidelines and Policy on Pre-Submission Consultation in the EA Process" states that "the proponent is responsible for initiating and carrying out PSC (pre-submission consultation) in a manner which fosters co-operation... The proponent documents the concerns raised by the affected parties... and explains how these concerns have been addressed in planning. This information constitutes part of the EA Submission to the Minister".

In order to ensure and encourage public comment and input, an extensive public participation program has been developed for the SWEAP project.

The "Solid Waste Management Appraisal Study", completed for Metro in 1986, initiated the public participation program. During the Appraisal Study, the public was contacted to ensure that future planning activities reflected public concerns. The Appraisal Study identified three principal tenets for public participation:

- the public must play an important role in the study process;
- an informed public is more likely to agree to a proposed plan than would a public that has a final decision forced upon it;
- a properly designed citizen participation process aimed at developing a significant degree of support for the master plan must proceed in parallel with the technical analysis.

During the Appraisal Study, two vehicles for public participation were formed: the Citizens' Advisory Committee and the Citizens' Network. The former comprised 13 persons, some of whom applied to become members and others who were invited because of their recognized involvement in environmental or solid waste matters. The Network was open to the public and, through newspaper advertisements, membership grew to over 200 people by February, 1987.

Public review during the Appraisal Study highlighted a number of issues requiring attention in succeeding activities, chiefly:

- the degree and manner in which the public would be able to influence the selection and role of different waste management options;

- the provision of adequate time for public review and response to proposals;

- the development of approaches and processes that would instill confidence that public involvement would be meaningful;

- the possible participation of the public in a to-be-developed management or steering committee.

Following completion of the Appraisal Study and the establishment of SWEAP, a core team was assembled within the Metro Works Department composed of a Project Manager, a Recycling Co-ordinator and a Public Participation Facilitator.

3.08 The Public Participation Process

The Appraisal Study public participation process resulted in the agreement among all parties on the strengths and weaknesses on the original process design. Following this, certain changes were made to the process in order to achieve a final, agreed-upon program of public participation. The following paragraphs describe the program. Further details on the process are provided in Discussion Paper 5.1.

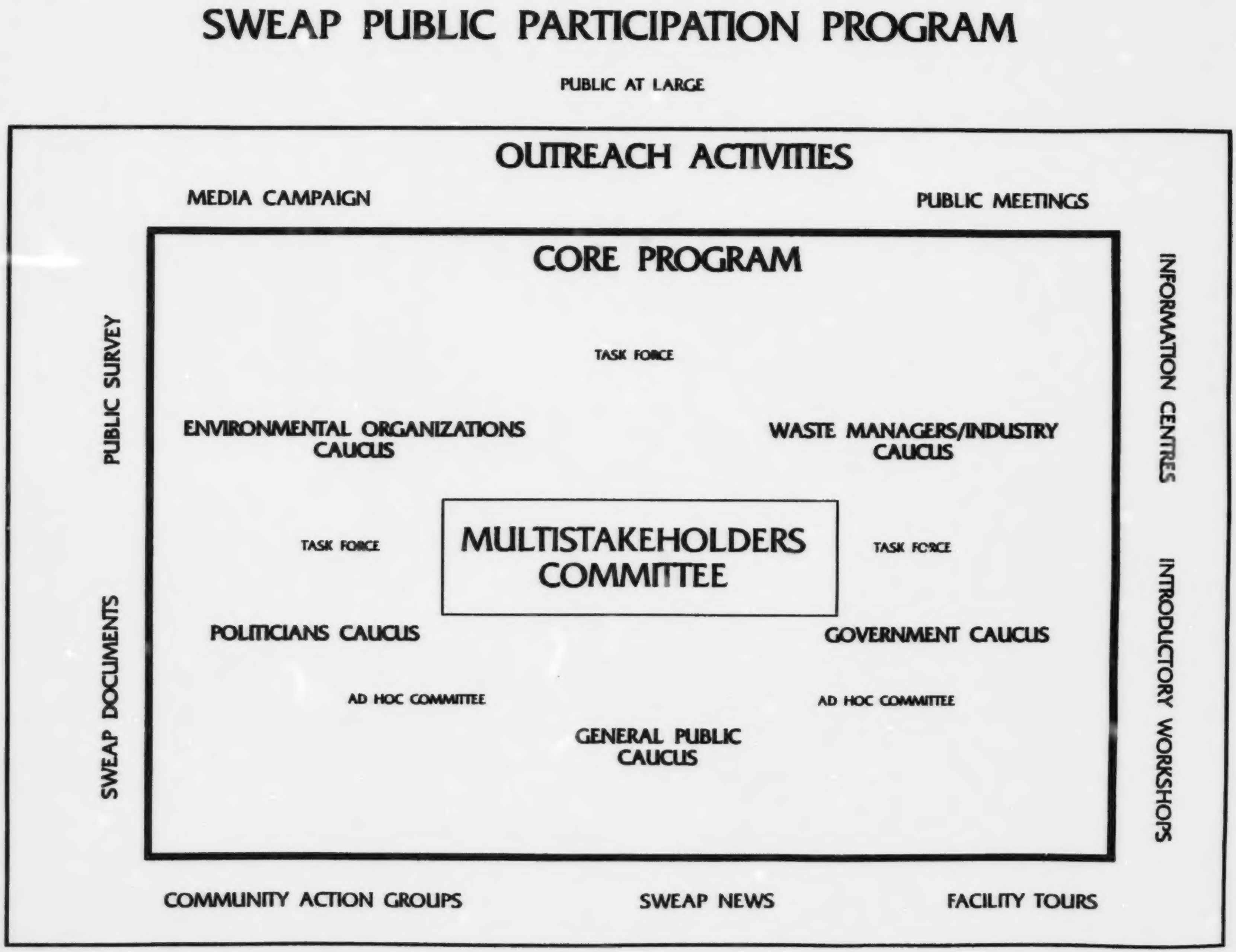
An initial program design was prepared and presented for comment and evaluation to interested members of the Citizen's Network (created during the Appraisal Study). The Core Program (see below) was developed through this process and it has continued to evolve to meet the needs and desires of its active participants.

In order to involve as many people and citizen groups as possible, advertisements were placed in community and daily newspapers, and all citizen and ratepayer groups shown on government mailing lists were sent a letter and the first issue of the newsletter, "SWEAP News". The response to these activities resulted in a "Participants List" of 1300 (now over 8,000) to replace the Citizen's Network. All those on the Participants List were invited to join the Core Program.

Core Program:

The Core Program in the public participation process involves five sector-specific Advisory Caucuses (each of which elects three representatives to an agreement - seeking body: the Multistakeholder Committee) and specific task forces and ad hoc committees. These are shown graphically in **Figure 3-1.**

FIGURE 3 - 1


SWEAP PUBLIC PARTICIPATION PROGRAM
PUBLIC AT LARGE
OUTREACH ACTIVITIES
MEDIA CAMPAIGN
PUBLIC MEETINGS
CORE PROGRAM
PUBLIC SURVEY
SWEAP DOCUMENTS
INFORMATION CENTRES
INTRODUCTORY WORKSHOPS
TASK FORCE
ENVIRONMENTAL ORGANIZATIONS CAUCUS
WASTE MANAGERS/INDUSTRY CAUCUS
TASK FORCE
MULTISTAKEHOLDERS COMMITTEE
TASK FORCE
POLITICIANS CAUCUS
GOVERNMENT CAUCUS
AD HOC COMMITTEE
AD HOC COMMITTEE
GENERAL PUBLIC CAUCUS
COMMUNITY ACTION GROUPS
SWEAP NEWS
FACILITY TOURS

The five Advisory Caucuses represent various public interests (i.e., stakeholders) as follows:

- environmental organizations: representatives from public groups involved in environmental programs as well as university environmentalists;
- government agencies: representatives from Works and Health departments from Metro, area municipalities and York and Durham Regions; Canadian Union of Public Employees; Ontario Hydro; Metro Region Conservation Authority;
- politicians: representatives of Municipal councils in Metro, York, Durham and their area municipalities; provincial representatives;
- waste managers/ industry: representatives from private sector waste management firms, industries and associations;
- general public: interested citizens not covered by any of the other groups.

The caucuses are designed to provide appropriate avenues for persons or groups with similar interests to discuss SWEAP issues and to arrive at some consensus on these issues. The caucuses function as autonomously as possible on such matters as their terms of reference, meeting times and places, rules of procedure and selection of the chair. The SWEAP public participation team provides support for the Advisory Caucuses.

The overall function of each caucus is to develop formal input to the Multi-stakeholder Committee (MSC) on solid waste management issues and to comment on SWEAP documents. Each caucus selects three representatives to serve as decision-making members of the MSC. Through these representatives, the views of the caucuses are presented to the MSC and those of all caucuses are communicated back to the individual caucuses.

The members of the MSC (three from each caucus) plus an independent chairperson form the centre of the Core Program. The primary function of the MSC is to establish areas of agreement and narrow areas of difference through a consensual decision-making process. The MSC reviews and priorizes recommendations received from the Advisory Caucuses and from task forces (see below), evaluates the recommendations and develops final versions of the recommendations to be presented to the SWEAP Steering Committee. The MSC has considerable autonomy and is supported by a project team secretary and an independent facilitator.

A further function of the MSC is to strike task forces on any area where detailed recommendations are needed. Membership in task forces is open to all Participants and can include caucus members. Task force recommendations are considered by all caucuses as well as the MSC.

3.09 Public Participation Activities to Date

Task Forces:

During the first year of the public participation program, six task forces worked under the Multistakeholder Committee. The goals of these task forces were as follows:

Site Criteria for Solid Waste Management Facilities:

- to develop criteria, and comment on similar criteria developed by the technical staff, for selecting landfill, incineration, composting and other facility sites.

Legislative Changes to Facilitate Reduction and Recycling:

- to recommend possible legislative initiatives at any level of government that would increase waste reduction or recycling;

- to priorize legislative actions that would result in as much reduction and recycling as soon as possible.

Waste Reduction:

- to develop a priorized program for waste reduction, including recommendations, that extend beyond SWEAP's direct mandate.

Evaluating the Mix of Alternatives:

- to develop appropriate criteria for determining the mix of solid waste management alternatives, including the priorization of alternatives for different parts of the waste stream;
- to develop a system for applying these criteria to SWEAP's projected waste stream.

Incineration:

- to priorize the factors to be considered in evaluating the incineration alternative.

Public Education:

- to provide direction for the implementation and promotion of waste reduction and recycling programs;
- to identify or develop topics, target groups, materials and methods for providing solid waste management information to the school-age and adult public.

Guiding Principles:

Among the most important products of the public participation program has been the preparation by the Multistakeholder Committee of a Statement of Guiding Principles for SWEAP. This statement was written and unanimously approved by the MSC members and is intended to form the basis for MSC decisions and recommendations. Three basic tenets underlie this statement, namely:

- waste should be minimized;
- negative environmental impacts should be minimized;
- all parts of the community should be involved in the development and implementation of the solid waste management system.

The Statement of Guiding Principles is presented in **Exhibit 3-2**. The guidelines state that there is a preferred hierarchy of waste management techniques: reduction, then reuse, then recycling and composting. Only after these techniques have been applied should consideration be given to landfilling, incineration or other disposal technology.

3.10 The Outreach and Communications Program

The basic core structure has succeeded in involving members of the public who wish to dedicate significant amounts of time to meetings and review of documents. A broader project to inform and invite input from every citizen is now being prepared: the Outreach Program.

While the core group will continue to act in its advisory capacity on current and subsequent documents and plans, the potential waste management system options are, at this stage, well enough defined to warrant extensive outreach and education.

EXHIBIT 3 - 2

STATEMENT OF GUIDING PRINCIPLES*

for the

SOLID WASTE ENVIRONMENTAL ASSESSMENT PLAN

of the Municipality of Metropolitan Toronto

The objective of the Solid Waste Environmental Assessment Plan (SWEAP) is to develop a waste management system that is ecologically sustainable and economically feasible. In order for this objective to be reached, all decisions in SWEAP should be evaluated in accordance with the following guiding principles.

1 **Hierarchy**	We are committed to a hierarchy of waste management options. The order of priorities for waste management shall be *reduction, reuse, recycling* and *recovery.* Wastes that presently cannot practicably be dealt with in these ways should be disposed (using the best available technology) in landfills, incinerators or other technology, whichever is most appropriate for the particular waste stream in question.
2 **Waste Reduction**	Our most important waste management measures are those that reduce the volume of waste we generate.
3 **Reuse**	We should strive to make products and packaging reusable and to encourage their reuse.
4 **Recycle & Compost**	We should strive to recycle or compost all wastes.
5 **Recovery**	We should attempt to recover energy, gases, fibres or other products from the waste.
6 **Implementation**	A firm commitment to ongoing progress up the hierarchy of waste management options should be reflected in policies, goals, planning, budgets and staff of all involved in waste management.
7 **Waste Monitoring**	We must continually monitor the composition, volumes and sources of our waste and the products of their disposition in order to evaluate existing programs and establish new ones.
8 **Public Involvement**	All residents and businesses in our municipalities are waste generators and must be involved in waste reduction efforts.
9 **Facility Siting**	There should be full public discussion of potential sites and of the short and long term effects of each waste management facility.

*Approved by the Multistakeholders Committee on December 8, 1988

The Outreach Program will:

- expose the larger public to solid waste management issues, practices and impacts through the use of multimedia communications designed to target a "generic" public;

- educate the public on solid waste management issues and practices that call for changes in personal approaches and attitudes (e.g., source separation and collection). This is intended to be a grass roots approach;

- provide opportunities and structures outside the Core Program through which previously uninvolved members of the public are able to comment on SWEAP developments; this will involve creating linkages to the core group.

3.11 Future SWEAP Activities

The third, fourth and fifth years of the SWEAP program extend over the years 1989 through 1992.

Technical activities over this period will include:

- implementation of waste reduction/recycling activities
- selection of appropriate solid waste management approaches
- analysis of markets for products recycled or otherwise produced by new Metro facilities and programs
- identification of candidate landfill sites
- site selection for landfills and other facilities
- environmental monitoring and assessment of each site
- engineering and costing for each of the selected waste management components
- completion of the necessary environmental assessment documents and supporting technical reports needed for hearings and approvals
- continuation of the waste composition study

Legal/jurisdictional activities during this period will include:

- development of the approvals strategy,
- provision of advice on issues such as mediation, compensation, intervenor funding, etc.
- resolution of jurisdictional responsibilities of area and regional municipalities, and
- preparation for hearings and approvals process.

Citizen participation activities over the third to fifth years will include:

- meetings of the various citizens' groups,
- regular communication activities,
- holding of public meetings, forums and open houses regarding solid waste management approaches and candidate sites and other issues as required,
- increased multimedia activities to educate the public and obtain input,
- educational activities to inform the public about waste management practices such as source separation and backyard composting.

The product of these activities will be the completion of the Environmental Assessment Document.

4.0 WASTE TO BE MANAGED

4.01 Defining the Waste to be Managed

Solid waste managed by Metro, and hence the waste to be addressed in this long-term plan, must conform to the MOE's requirements as set out in Regulation 309 of the EPA and in the Certificates of Approval for Metro's waste management facilities. This type of waste is defined as municipal, commercial and non-hazardous industrial solid waste.

Waste not managed under this Plan includes liquid industrial waste and industrial and residential hazardous waste. Residential hazardous waste is managed by Metro through ten household hazardous waste depots and a pilot on-call collection service called the "toxics taxi".

4.02 Estimating Waste Quantities to be Managed

Estimates of the quantity and type of waste to be managed by the system provide the basis for the solid waste management planning process. The basic elements governing solid waste generation are considered to be population and industry characteristics. Other factors related to waste generation include:

- degree of urbanization (generally, waste generation rates are lower in rural areas),
- technological change affecting the amount of material discarded,
- lifestyle of residents,
- seasonal patterns,
- type of commercial and industrial activity,
- public awareness of environmental issues.

The amount of solid waste collected by Metro area municipalities over the period 1977-1988 is presented in **Table 4-1**. The total amount of solid waste (both municipal and private) managed at Metro facilities is shown graphically in **Exhibit 4-2**. The data on municipally collected waste show significant increases for the

TABLE 4 - 1

METROPOLITAN TORONTO MUNICIPALLY COLLECTED WASTE

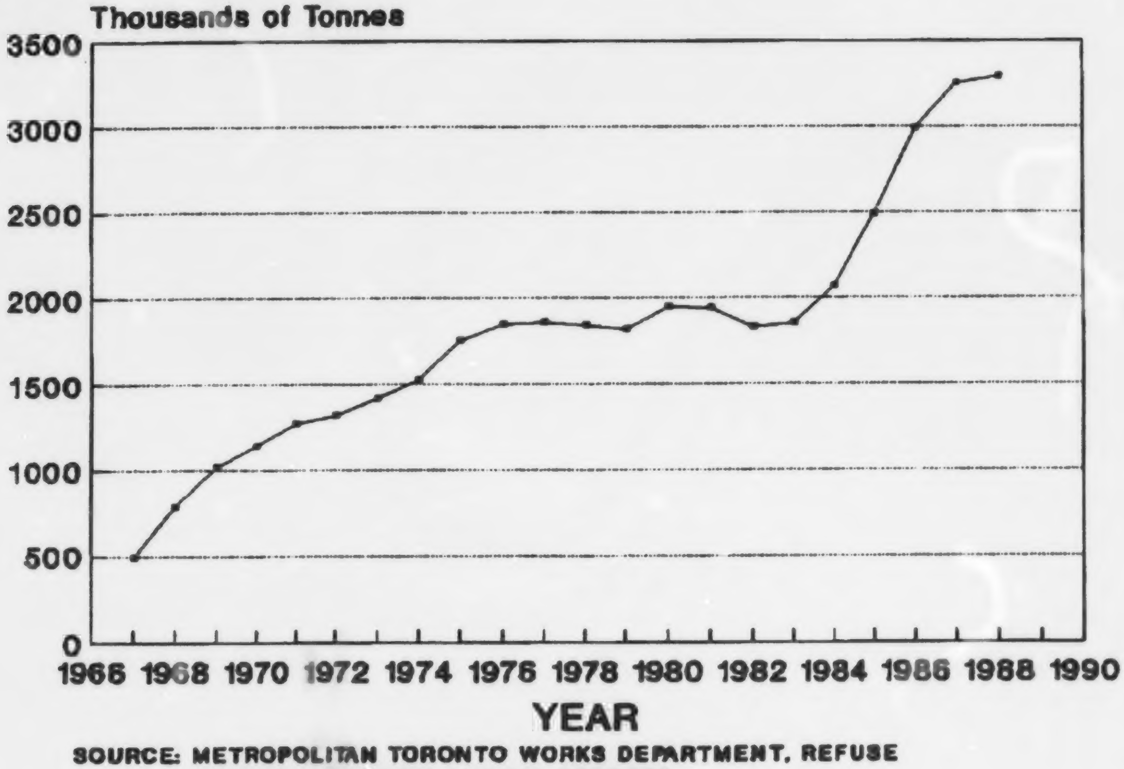
AREA MUNICIPALITY	YEAR											
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
EAST YORK	38,877	37,151	41,736	42,156	42,873	44,144	43,501	44,155	42,885	49,316	46,481	44,134
ETOBICOKE	110,667	104,403	115,984	110,198	104,110	112,856	112,069	112,691	132,770	135,167	139,397	137,612
NORTH YORK	208,746	198,193	199,478	200,988	204,330	202,195	200,665	207,708	213,047	236,633	225,363	229,159
SCARBOROUGH	149,618	148,122	157,368	164,188	172,596	167,053	163,915	174,223	179,948	184,255	188,388	185,428
TORONTO	308,365	300,371	293,708	285,379	294,796	301,495	295,937	307,624	314,000	335,225	333,544	328,079
YORK	59,978	57,845	59,223	58,362	53,341	57,307	56,856	63,914	64,334	66,647	66,849	64,250
TOTAL MUNICIPAL SOLID WASTE (TONNES)*	876,251	846,085	867,497	861,271	872,046	885,050	872,943	910,315	946,984	1,007,243	1,000,022	988,662

SOURCE: METROPOLITAN TORONTO WORKS DEPARTMENT, SOLID WASTE MANAGEMENT DIVISION ANNUAL REPORTS

* TOTALS INCLUDE DOMESTIC WASTE AND OTHER MUNICIPALLY COLLECTED WASTES SUCH AS STREET SWEEPINGS, CATCH BASIN CLEANINGS, AND LEAVES

EXHIBIT 4 - 2

ANNUAL TOTALS OF SOLID WASTE MANAGED AT METROPOLITAN TORONTO FACILITIES



SOURCE: METROPOLITAN TORONTO WORKS DEPARTMENT, REFUSE DISPOSAL DIVISION ANNUAL REPORTS years 1984-1986 and a steadying thereafter at approximately 1.0 million tonnes per year. This trend can also be seen in terms of municipally collected waste generated per capita, as shown in **Table 4-3**, with generation rising from 0.40 tonnes per capita in 1977 to 0.46 tonnes per capita in 1987 and 1988.

This trend in waste generation rates is consistent with experience in other jurisdictions; for example, U.S. studies report increases in rates from 0.40 tonnes per capita in 1970 to 0.51 tonnes per capita in 1984 (Franklin Associates, 1986). A large number of factors affect domestic waste generation rates, including the decline in household size, increasing affluence, packaging changes and technological changes.

As well as domestic waste, two other types of waste are managed at Metro facilities: non-domestic municipal waste and commercial/industrial waste. The former category includes waste generated by area municipalities, local boards and commissions and departments (such as street sweepings and sewage sludge); the later category includes waste generated within Metro by business establishments that is managed at Metro facilities.

In 1988, Metro's area municipalities delivered to Metro facilities a total of 917,900 tonnes of domestic waste; a further 209,200 tonnes were received from local boards, facilities and other sources, for a total of 1,127,000 tonnes. This waste was managed as follows:

Handled at Metro transfer stations prior to ultimate landfill disposal	890,400	tonnes
Hauled directly to Metro landfills	182,000	tonnes
Incinerated at the now closed Commissioners Street Incinerator	54,600	tonnes
Total managed	1,127,000	tonnes

In addition to the above quantities, the Regions of York and Durham were reported to have generated 507,000 tonnes and 337,000 tonnes of solid waste respectively in 1988 (Metro Works Dept. estimates, 1988), of which 88% was disposed of in

TABLE 4 - 3

ESTIMATED PER CAPITA SOLID WASTE GENERATION RATES FOR METROPOLITAN TORONTO AREA MUNICIPALITIES

AREA MUNICIPALITY	TONNES/CAPITA/YEAR*											
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
EAST YORK	0.38	0.36	0.41	0.42	0.43	0.44	0.44	0.45	0.44	0.51	0.46	0.46
ETOBICOKE	0.38	0.36	0.40	0.38	0.35	0.38	0.38	0.38	0.45	0.46	0.46	0.47
NORTH YORK	0.37	0.36	0.36	0.36	0.37	0.36	0.36	0.37	0.38	0.43	0.41	0.42
SCARBOROUGH	0.38	0.37	0.38	0.38	0.40	0.38	0.37	0.39	0.39	0.40	0.39	0.39
TORONTO	0.47	0.47	0.46	0.45	0.48	0.49	0.50	0.52	0.52	0.57	0.54	0.55
YORK	0.44	0.43	0.44	0.44	0.41	0.43	0.42	0.48	0.48	0.50	0.49	0.49
METROPOLITAN TORONTO	0.40	0.39	0.41	0.41	0.41	0.41	0.41	0.43	0.44	0.48	0.46	0.46

SOURCE: METROPOLITAN TORONTO WORKS DEPARTMENT, SOLID WASTE MANAGEMENT DIVISION ANNUAL REPORTS

* TOTALS INCLUDE DOMESTIC WASTE AND OTHER MUNICIPALLY COLLECTED WASTE SUCH AS STREET SWEEPINGS, CATCH BASIN CLEANINGS, AND LEAVES

Metro's landfill sites. An estimated 50,000 tonnes of solid waste was received at Metro facilities in 1988 from Peel Region, the Town of Orangeville and other areas. Other wastes received at Metro facilities in 1988 included privately collected commercial and industrial waste plus ash from the burning of solid waste at the Commissioners Street Incinerator.

The total amount of waste managed at Metro facilities in 1988 was 3,294,000 tonnes, as follows:

Keele Valley Landfill:	2,186,000	tonnes	(66%)
Brock West Landfill:	1,042,000	tonnes	(32%)
Incinerator:	66,000	tonnes	(2%)
TOTAL:	3,294,000	tonnes	(100%)

4.03 Population Forecasts

Solid waste generation is influenced by many factors but, in particular, population growth and commercial and industrial activity. For an area with as large and diverse an industrial base as Metro, it is difficult to determine one factor on which estimates and forecasts of commercial and industrial waste can be based. Changes in the industrial base and in the processes and technologies in use, make correlations of waste generated to employee or to square metre of industrial space of little value. For this reason, commercial/industrial waste has been estimated on a per capita basis in this study. Population forecasts used in the analysis were developed by Metro Planning Department.

The actual and projected populations for Metro are presented in **Table 4-4**. The data show that Metro population is forecast to increase from 2.13 million in 1988 to 2.53 million by the year 2011 and to 2.58 million by the year 2031.

TABLE 4 - 4

ACTUAL AND PROJECTED POPULATION FOR METROPOLITAN TORONTO BY AREA MUNICIPALITY

AREA MUNICIPALITY	YEAR ACTUAL 1971	 1981	 1988	 PROJECTED 1991	 2001	 2011	 2021	 2031
EAST YORK	101,965	98,980	96,497	104,100	106,000	105,000	103,300	100,500
ETOBICOKE	280,722	294,660	293,433	317,000	325,300	322,000	317,600	304,200
NORTH YORK	514,817	560,410	544,460	585,500	653,000	693,000	736,000	757,800
SCARBOROUGH	325,331	427,500	470,406	523,000	542,100	544,400	544,800	531,000
TORONTO	680,319	620,000	597,126	643,400	689,900	716,000	736,000	742,300
YORK	142,296	130,830	131,537	141,200	147,800	147,000	144,600	141,800
METROPOLITAN TORONTO	2,045,450	2,132,380	2,133,459	2,314,200	2,464,100	2,527,400	2,582,300	2,577,600

SOURCE: METROPOLITAN TORONTO PLANNING DEPARTMENT (1988)

4.04 Waste Generation Rates

Utilizing the data on population and waste managed at Metro facilities presented above, it is possible to develop unit generation rates by area municipality for both domestic waste and commercial/industrial waste.

These data are shown for the year 1988 in **Table 4-5**. The average waste generation rate for Metro is 1.23 tonnes per capita. Per capita rates of generation range from 0.68 tonnes in East York to 1.50 tonnes in Etobicoke. This variation mainly reflects the differences in commercial and industrial activity among the municipalities.

4.05 Sources of Waste

Sources of solid waste to be managed at Metro facilities can be grouped into three broad categories: domestic, other municipal and private. The relative proportions for each type are approximately as follows (see Figure 4-1, Discussion Paper No. 3.2):

- Residential Waste		
- curbside	32%	
- bulk	7%	
Subtotal		39%
- Other Municipal Wastes		
- sewage sludge	5%	
- other	5%	
Subtotal		10%
- Private Waste		
- commercial	22%	
- industrial	22%	
- construction and demolition	5%	
- miscellaneous	2%	
Subtotal		51%
TOTAL		100%

TABLE 4 - 5

METROPOLITAN TORONTO SOLID WASTE GENERATION RATES (1988)

METROPOLITAN TORONTO UNIT GENERATION AREA	1988 POPULATION	DOMESTIC SOLID WASTE GENERATED IN 1988 (TONNES)	COMM/IND SOLID WASTE GENERATED IN 1988 (TONNES)	TOTAL SOLID WASTE GENERATED IN 1988 (TONNES)	SOLID WASTE GENERATION RATE (TONNES/ CAPITA/YEAR)
EAST YORK	96,497	44,585	28,162	72,747	0.75
ETOBICOKE	293,433	132,868	337,965 *	470,833	1.60
NORTH YORK	544,460	215,202	420,929	636,131	1.17
SCARBOROUGH	470,406	175,903	344,913	520,816	1.11
TORONTO	597,126	292,327	515,557	807,884	1.35
YORK	131,537	57,000	69,008	126,008	0.96
METROPOLITAN TORONTO	2,133,459	917,885	1,716,534 **	2,634,419	1.23

SOURCE: METROPOLITAN TORONTO REPORTED WEIGHSCALE SOURCE AREA DECLARATIONS (1988)
METROPOLITAN TORONTO PLANNING DEPARTMENT (1988)

* INCLUDES SEWAGE SLUDGE FROM METRO'S HUMBER SEWAGE TREATMENT PLANT

** TOTAL INCLUDES SOLID WASTE RECEIVED FROM METROPOLITAN TORONTO DEPARTMENTS AND NON-DOMESTIC MISCELLANEOUS SOLID WASTE GENERATED BY METRO'S AREA MUNICIPALITIES, LOCAL BOARDS, AND COMMISSIONS

The various sources of waste differ in the degree of available information and the degree of municipal control over collection. The residential waste stream has the most documented information on composition, quantities and sources; curbside-collected waste is the largest single stream in the study area. Residential and "other municipal wastes" are collected by, and hence under the control of, the area municipalities.

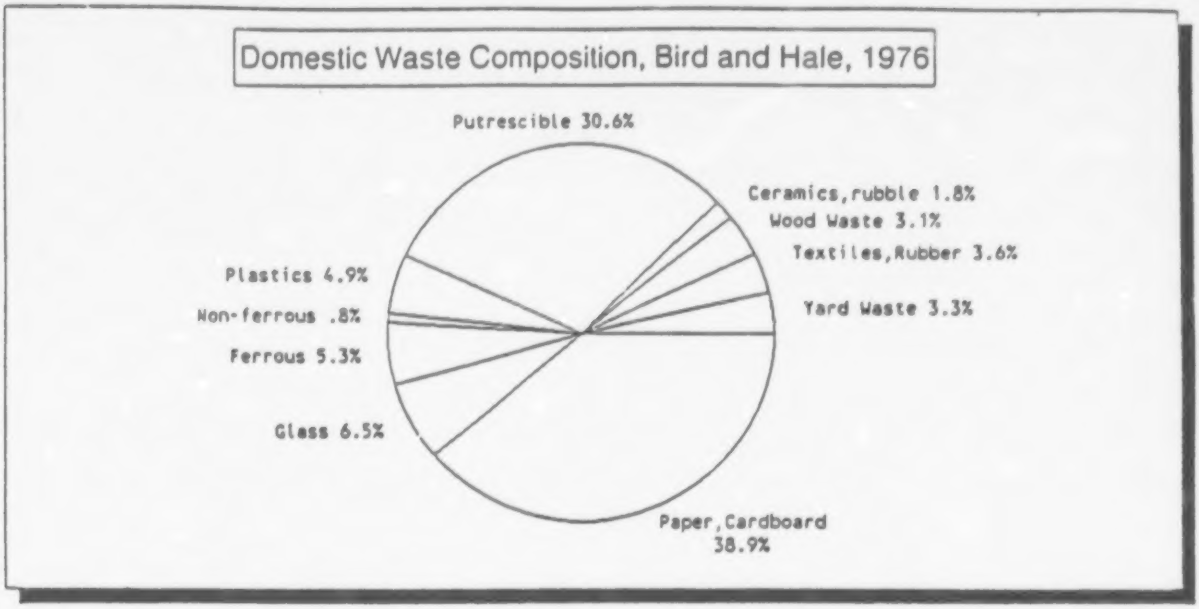
"Other municipal waste" is non-domestic waste collected by municipalities. It includes curbside collection from some commercial establishments, street sweepings, litter, Parks Department waste, waste from municipal offices and institutions, and such waste as sewage sludge and ash from incineration. Much of this "other municipal waste" would have a composition similar to commercial waste (and is thus usually included in commercial/industrial waste totals). The composition of this waste can be more reliably estimated than the composition of commercial/industrial waste.

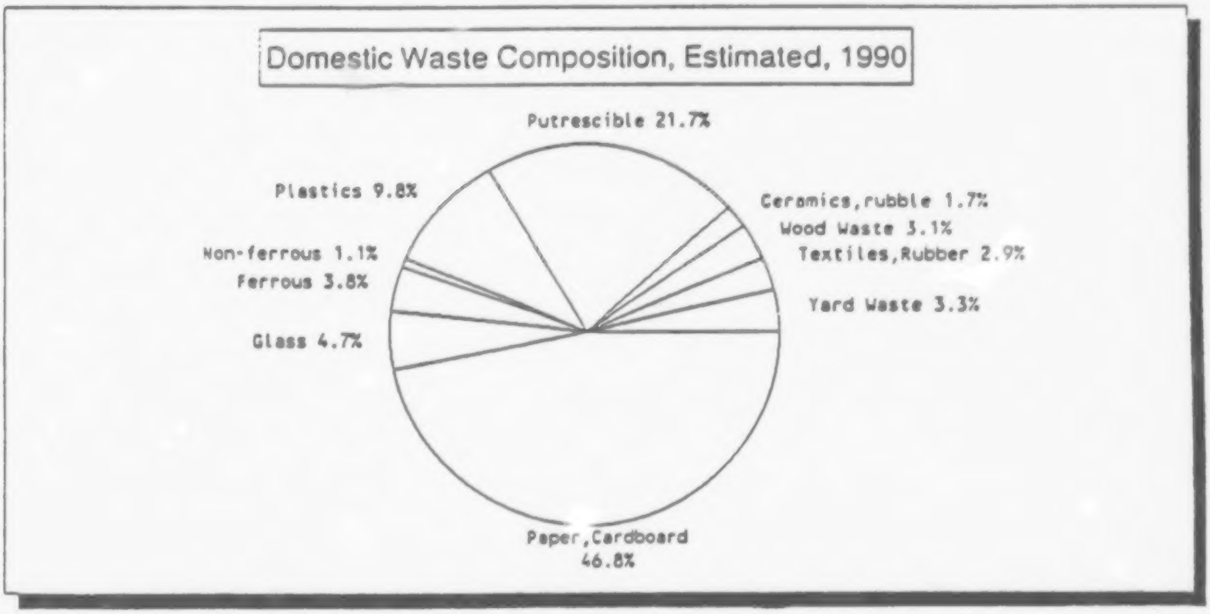
Unlike the residential waste stream, commercial, industrial, institutional and other privately collected wastes only become available for management by Metro if they are delivered to a Metro operated facility. Metro has no direct control and limited indirect control over the collection and handling of these wastes prior to their delivery. However, under Section 66 of the Metro Act, Metro can mandate the manner in which waste is received at any Metro waste management facility.

Commercial/industrial waste generators and the private haulers of these wastes can reduce waste generation, recycle waste outside Metro, export some waste to other jurisdictions or establish private waste management facilities. For this reason, under any solid waste management system, Metro can be reasonably certain of controlling the disposition of only the residential and "other municipal waste" streams. Metro can, however, provide appropriate facilities to handle the privately collected waste and can provide incentives to encourage and regulate their disposal.

FIGURE 4 - 6

Waste Composition





Source: Discussion Paper 3.2

Metro establishes tipping fees at its disposal facilities. If the private sector realizes it can reduce, reuse, recycle, recover or otherwise dispose of its waste for less than the tipping fee, the waste will generally not arrive at municipal facilities. If Metro provides facilities to recycle or compost privately collected waste, those facilities will generally attract only privately collected waste that cannot be managed at lower prices by private facilities.

The actual results of any implemented plan tend to be more predictable for residential waste and other municipally collected waste than for privately collected waste.

4.06 Waste Composition

As alternatives to landfilling receive more attention, knowledge of the composition of the waste stream becomes more vital. The glass, metal, newsprint, plastic and other constituents determine what management methods are appropriate and what capacities of facilities should be considered. For example, for the paper and cardboard fraction of the waste stream, it is desirable to know the relative amounts of corrugated cardboard, newspaper, fine paper, boxboard and other grades. Data of moisture content, density, chemical composition and heat value of each fraction are also valuable.

Figure 4-6 presents estimated waste composition of the residential stream, derived from the literature. It is important to note that significant changes have taken place over the period since 1976, especially the large increases in plastics and paper. MOE is currently conducting a province-wide domestic waste composition study.

Information on the commercial/industrial solid waste stream is very community specific, reflecting the unique industrial mix of the municipality. A Metro-wide study is being undertaken at this time.

4.07 Future Trends in Waste Generation and Composition

Forecasting the future is more of an art than a science and this is true for solid waste generation and composition. Along with general trends occurring gradually over a period of many years, individual events can cause significant changes. For example, the oil crisis in the 1970's was totally unexpected and led to significant changes in economic growth and investment. Trends in industrial activity, especially notable in the shift from primary industry to the service industry in North America, have led and will continue to lead to changes in waste generation and composition. This section of the report attempts to identify factors that can lead to changes in the amount and type of solid waste that will have to be managed over the planning period. Much of this information is derived from the report "Characterization of Municipal Solid Waste in the U.S. 1960-2000" (Franklin Associates Ltd., Kansas, 1986).

Four basic factors relate to basic changes that will shape solid waste generation: population, social patterns, technological changes and packaging changes. Change in population is one of the most important factors in the future growth of solid waste. Metro and surrounding communities face the fastest growth rate of any urban area in Canada due to the area's economic strength. This growth is reflected in the population forecasts presented in Section 4.03 of this report.

Social factors also relate strongly to waste generation. Increasing affluence leads to increases in the purchase of goods that result in the generation of waste. Similarly, products are now geared to disposability rather than repair, also leading to increased waste generation. Changes in family life, including the increases in single parent households and two-earner households also lead to increased waste generation because of the purchase of more convenience foods and other convenience (disposable) items. Another social pattern of note is increasing environmental awareness, especially related to waste management. As the public becomes more aware of the management problem, industry is likely to respond with products and packaging that produce less waste or waste that is more amenable to reuse, recovery and recycling.

Technological change also can impact waste generation. Two significant examples are computers and micro-wave ovens. Computers were first thought to lead to the reduction of paper waste but have actually resulted in the reverse. Micro-wave ovens have increased the use of frozen and other packaged foods both in the home and in commercial establishments.

Packaging trends operate in two directions. The increased use of convenience items and prepackaging of goods that used to be available on a bulk basis (for example, hardware supplies) has increased the amount of waste requiring management. On the other hand, changes in packaging in many cases result in more efficient packaging (i.e., plastic wrap rather than cardboard or metal containers). While U.S. studies indicate no net change over the 1960-1975 period in terms of packaging per person, a recent report ("New York State Solid Waste Management Plan", New York State Dept. of Environmental Conservation, March 1988) forecasts a 25% increase in packaging related waste per capita over the 1986-1996 period. Overall, these trends have resulted in changes in the composition of the waste: from metals, glass and some types of paper to plastics.

As a result of these structural changes occurring now and expected to continue, it is possible to indicate in broad terms what may happen to the solid waste stream in terms of quantity and quality.

Paper and Paperboard Products:

- books and magazines - changing social and educational patterns are leading to a proliferation of special interest publications; also, increases in direct mail advertising and in mail order catalogues; this is related to general economic activity;

- commercial printing - increases in advertising and in set up of small business leads to increases in commercial printing; this is related to economic activity;

- office papers - significant increases over the past ten years through the use of computers, photocopying and facsimile equipment; this growth may be expected to continue;

- other elements - paper plates and cups have been declining; similarly, paper and paperboard packaging, while increasing, has been offset to some degree by changes to plastic packaging and other materials.

Glass Containers:

- glass containers face competition from metal and plastics (beer and soft drink industries).

Plastics:

- plastics have increased significantly as part of the waste stream over the past 20 years; plastics have displaced glass, paper and metal packaging; this may be expected to continue.

Metals:

- steel packaging is declining in the waste stream due to competition from aluminum beverage containers and from some plastic applications (e.g., drums and pails); steel containers continue to be used in food cans;

- aluminum has shown great increases in use, especially in beverage containers; also, its use has been increasing in convenience food packaging.

In summary, recent trends in waste generation and composition suggest that:

1. Waste generated per person has increased because of an increase in the use of convenience items and in paper products;

2. Waste composition has changed with continued increases in paper, plastics and aluminum; and,

3. The type of waste requiring management includes increased quantities of commercial and industrial waste.

4.08 Forecast of Waste to be Managed

Forecasting the amount of solid waste to be managed over the next 20 to 40 years is an imprecise and judgmental task. As indicated above, changes in population, social patterns, technology and packaging will occur, with implications for the waste stream we cannot now estimate.

Per capita generation rates have grown fairly consistently over the past 50 years. While many factors have been considered to contribute to this growth, there is no accepted model to predict this growth.

In preparing projections of solid waste to be managed by Metro, two factors have been utilized: population growth and per capita waste generation growth. The population forecast was supplied by Metro Planning Department and is based on their Demographic Model; this forecast is presented in **Table 4-7**.

The forecast of per capita waste generation growth is based upon municipally collected waste over the ten-year period 1979-1988, and has been calculated as 1.3% per year. It is acknowledged that shortening or lengthening this historical period will affect this estimated growth rate, however, 1.3% is considered a reasonable basis for forecasting purposes. Because no data are available on long-term trends in commercial and industrial waste generation, this domestic growth rate has also been applied to this waste type.

Total waste generation per capita in Metro in 1988 was 1.23 tonnes. Applying the 1.3% annual growth estimate to this figure results in a waste generation rate of 1.52 tonnes per capita at the end of the 20-year period (2010). The combination of

TABLE 4 - 7

FORECAST OF SOLID WASTE TO BE MANAGED BY
METROPOLITAN TORONTO

YEAR	POPULATION FORECASTED	MUNICIPAL SOLID WASTE (TONNES)	COMMERCIAL/ INDUSTRIAL WASTE (TONNES)	TOTAL SOLID WASTE GENERATION (TONNES/YEAR)
1988	2,133,459	918,000	1,717,000	2,634,000
1989	2,193,706	955,000	1,789,000	2,744,000
1990	2,253,953	994,000	1,862,000	2,855,000
1991	2,314,200	1,033,000	1,936,000	2,970,000
1992	2,329,190	1,054,000	1,974,000	3,027,000
1993	2,344,180	1,074,000	2,012,000	3,086,000
1994	2,359,170	1,095,000	2,051,000	3,146,000
1995	2,374,160	1,116,000	2,091,000	3,207,000
1996	2,389,150	1,138,000	2,131,000	3,269,000
1997	2,404,140	1,159,000	2,172,000	3,332,000
1998	2,419,130	1,182,000	2,214,000	3,396,000
1999	2,434,120	1,204,000	2,256,000	3,461,000
2000	2,449,110	1,227,000	2,300,000	3,527,000
2001	2,464,100	1,251,000	2,344,000	3,594,000
2002	2,470,430	1,270,000	2,380,000	3,650,000
2003	2,476,760	1,290,000	2,417,000	3,707,000
2004	2,483,090	1,310,000	2,454,000	3,764,000
2005	2,489,420	1,330,000	2,492,000	3,822,000
2006	2,495,750	1,351,000	2,531,000	3,881,000
2007	2,502,080	1,372,000	2,570,000	3,942,000
2008	2,508,410	1,393,000	2,610,000	4,002,000
2009	2,514,740	1,414,000	2,650,000	4,064,000
2010	2,521,070	1,436,000	2,691,000	4,127,000
	TOTALS	27,566,000	51,644,000	79,207,000

population growth and generation growth results in the forecast of waste to be managed by Metro as presented in **Table 4-7**. This forecast may be summarized as follows:

Planning Period 1991-2010

Total Waste to be Managed:	71,000,000	tonnes
Average Annual Tonnage to be Managed:	3,500,000	tonnes

This forecast may be refined prior to the final master plan report. Nevertheless, the forecast is within sufficient bounds of probability to enable identification of reasonable waste management approaches.

4.09 Wastes Not Presently Managed by Metro

The discussion thus far has focused on waste requiring management by Metro. Other categories of solid waste not presently requiring Metro management include privately recycled commercial and industrial waste, exported waste and earth and clean fill now lakefilled. These wastes totalled over 4.0 million tonnes in 1987 (the last year for which data are available) as shown in **Exhibit 4-8**.

There are indications that Leslie Street Spit, site of present lakefilling, may be closed to fill in 1991. Should Metro be required to manage this waste, efforts should commence immediately to plan for managing the earth and clean fill without using up the diminishing capacity of existing Metro landfills. As well, the wastes previously exported are now being landfilled at Metro facilities.

EXHIBIT 4 - 8

ESTIMATED TOTAL SOLID WASTE GENERATED IN METROPOLITAN TORONTO IN 1987

Type of Solid Waste Generated and Management Approach	**Tonnes Generated in 1987**
Solid Waste Managed by Metro	
- Solid Domestic Waste - Landfilled[1] and Incinerated[2]	910,000
- Solid Waste from Municipal Operations and Facilities - Landfilled	228,500
- Digested Sewage Sludge and Water Treatment Plant Screenings - Landfilled	126,500
- Commercial and Industrial Waste - Landfilled	1,200,500
- Domestic Waste - Recycled by Blue Box Program	22,000
Sub-Total	2,507,500
Other Wastes Managed By Metro	
- Sewage Sludge - Incinerated	456,200
- Incinerated Sewage Sludge Ash - Stored On-Site	26,000
Sub-Total	482,200
Solid Waste Not Managed By Metro	
- Commercial and Industrial Waste - Recycled Privately	1,750,000
- Solid Waste Exported and Landfilled[4]	100,000
- Earth and Clean Fill - Landfill[5]	2,300,000
Sub-Total	4,150,000
Estimated Total Solid Waste Generated In Metro	**7,139,700**

Source: Metropolitan Toronto Department of Works - Discussion Paper No. 4.1 and Discussion Paper No. 4.2 - Solid Waste Management System Inventory 1986 and 1987.

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1. This estimate does not include solid wastes generated in other jurisdictions that are managed by Metro. Discussion Paper No. 4.2 provides these estimated.

2. In 1987, approximately 138,200 tonnes of waste was managed at the Commissioners Street Incinerator. The incinerator was closed in August 1988.

3. Includes wastes generated by Metro, Area Municipalities, Boards and Agencies.

4. As of October 1989, these wastes are now landfilled at Metro facilities due to the closure of the Steetley Industries Limited Landfill in Dundas.

5. These wastes are managed by the Toronto Harbour Commission and Metropolitan Toronto Regional Conservation Authority.

5.0 EXISTING WASTE MANAGEMENT SYSTEM

5.01 System Overview

The solid waste management system in Metro comprises collection activities undertaken by each area municipality and by private industry and disposal activities undertaken by Metro. Metro's disposal facilities - Keele Valley Landfill and Brock West Landfill - manage about 95% of all solid waste generated in Metro. At present, waste from the Scarborough Transfer Station and from the Region of Durham is disposed of at the Brock West Landfill and the remainder of Metro's waste and that from the Region of York is disposed of at the Keele Valley Landfill. Until August, 1988, Metro operated the Commissioners Street Incinerator located in the City of Toronto. The quantity of waste disposed of at each facility in 1988 was:

Brock West	2,186,000	tonnes
Keele Valley	1,042,000	tonnes
Incinerator	66,000	tonnes
TOTAL:	3,294,000	tonnes

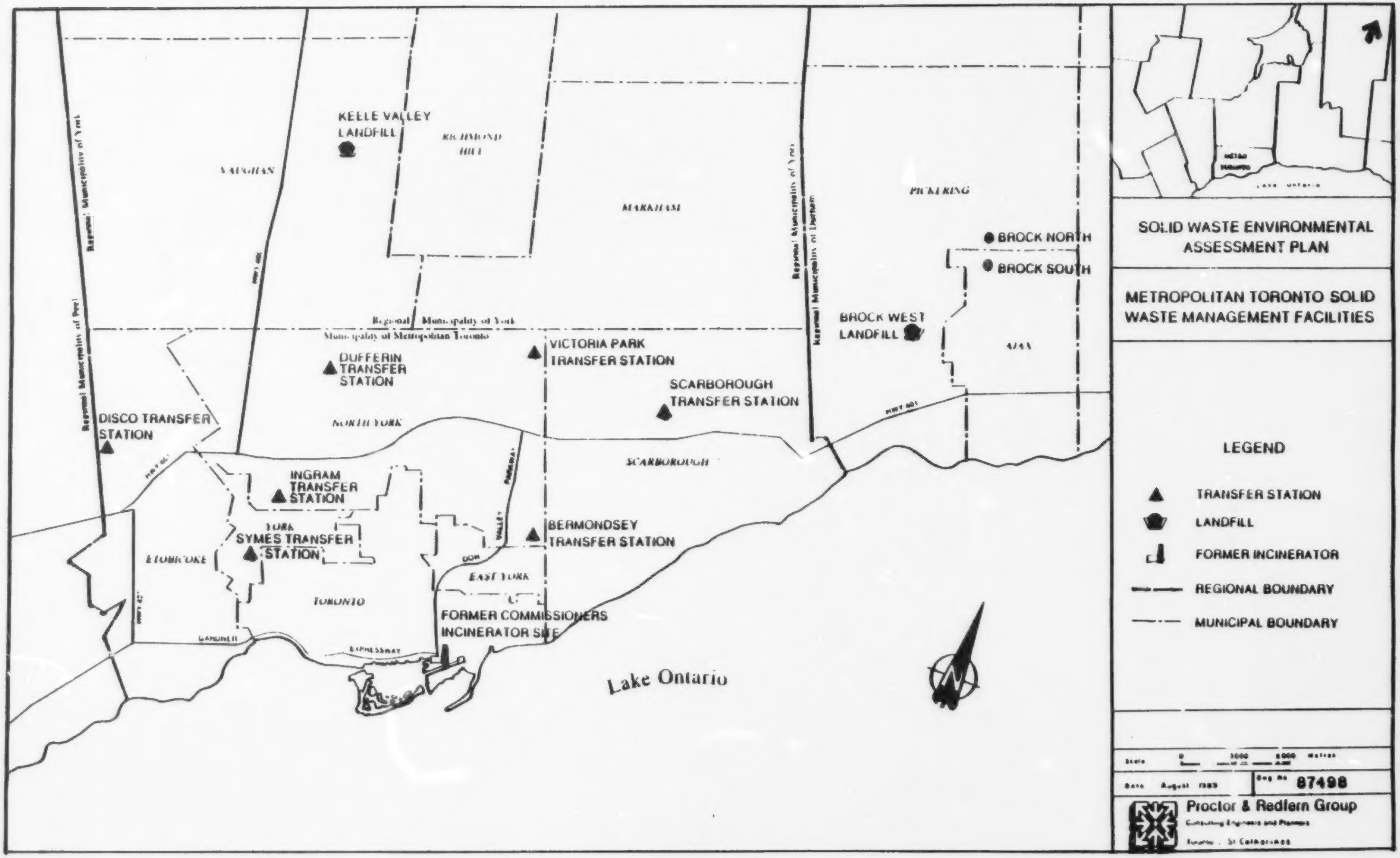
The locations of Metro waste management facilities in 1988 is shown on **Map 5-1**.

Metro operates seven transfer stations: Bermondsey, Disco, Dufferin, Ingram, Scarborough, Symes and Victoria Park. Two other transfer stations are located in Metro but are privately owned (Harkow and Unwin).

5.02 Contractual Agreements

Metro owns and operates the Keele Valley Landfill in the Region of York and the Brock West Landfill in the Region of Durham. In each case, legal contractual agreements are in force between Metro and the Region and area municipality in which the landfill is located.

MAP 5 - 1


KEELE VALLEY LANDFILL
RICHMOND HILL
VAUGHAN
MARKHAM
PICKERING
AJAX
BROCK NORTH
BROCK SOUTH
BROCK WEST LANDFILL
Regional Municipality of York
Regional Municipality of Peel
Regional Municipality of Durham
Municipality of Metropolitan Toronto
VICTORIA PARK TRANSFER STATION
DUFFERIN TRANSFER STATION
SCARBOROUGH TRANSFER STATION
DISCO TRANSFER STATION
NORTH YORK
SCARBOROUGH
HWY 401
HWY 400
HWY 427
INGRAM TRANSFER STATION
YORK
SYMES TRANSFER STATION
ETOBICOKE
TORONTO
EAST YORK
DON VALLEY PARKWAY
BERMONDSEY TRANSFER STATION
FORMER COMMISSIONERS INCINERATOR SITE
GARDINER
EXPRESSWAY
Lake Ontario
METRO TORONTO
LAKE ONTARIO
SOLID WASTE ENVIRONMENTAL ASSESSMENT PLAN
METROPOLITAN TORONTO SOLID WASTE MANAGEMENT FACILITIES
LEGEND
▲ TRANSFER STATION
LANDFILL
FORMER INCINERATOR
REGIONAL BOUNDARY
MUNICIPAL BOUNDARY
Scale 0 3000 6000 Metres
Date August
Dwg No 87498
Proctor & Redfern Group
Consulting Engineers and Planners
Toronto . St Catharines

An agreement signed in 1983 between Metro and York Region sets out the terms and conditions on which York consented to Metro establishing and operating the Keele Valley Landfill in the Town of Vaughan. Metro is obligated under this agreement to accept York waste to the year 2003 and to accept only residuals thereafter.

In February 1970, Metro entered into an agreement with the Town of Pickering in which the latter agreed to Metro's acquiring the landfill sites in the Township now known as Brock West, Brock North and Brock South. The Agreement was revised in 1978. Metro's obligation was discussed in Section 1.03 (Page 5).

5.03 Facility Costs

The operating costs of the various components of Metro's waste disposal systems, as obtained from a review of total expenditure figures for Metro (**Table 5-2**) in 1988, can be summarized as follows:

landfills	$ 6.40 / tonne
transfer stations	$16.03 / tonne
average cost (excluding incineration)	$22.43 / tonne
average cost of incineration	$ 46.12 / tonne
	(Commissioner's Street Incinerator now closed)

Metro's municipal share of the total was raised by tax levy upon the six area municipalities in the manner indicated on **Table 5-3**.

Information on how the total expenditure of $67.0 million was made up is shown in **Table 5-4**.

5.04 Capacities of Existing Facilities

Landfill capacity is dictated by the Provisional Certificate of Approval issued by MOE. These certificates cite drawings, final surface contours, etc. which are used as the basis for determining when a site is "full".

TABLE 5 - 2
FACILITY COSTS
1988

	Salaries $	Fringe Benefits $	Supplies & Services $	Tonnes Processed $	Cost Per Tonne $
INCINERATION					
Commissioners	1,347,330	377,146	980,304	66,163	
Mech. & Elect. Maint.	175,799	30,792	24,289	-	
Constr. & Grounds Maint.	24,126	04,400	08,399	-	
Equip. Replacement Reserve	-	-	34,093	-	
Admin. and Insurance	20,112	02,710	21,848	-	
	1,567,367	415,048	1,068,933	66,163	46.12
LANDFILL					
Brock West	2,279,922	396,855	4,265,126	1,041,515	
Keele Valley	2,493,410	391,475	7,294,263	2,186,282	
Mech. & Elect. Maint.	312,112	54,668	43,123	-	
Constr. & Grounds Maint.	529,802	96,617	164,448	-	
Equip. Replacement Reserve	-	-	2,045,580	-	
Admin. and Insurance	127,756	17,214	138,784	-	
	5,743,002	956,829	13,971,324	3,227,797	6.40
TRANSFER STATIONS					
Bermondsey	1,609,260	299,418	1,859,059	232,633	
Disco	870,779	138,623	1,587,437	222,280	
Ingram	1,592,090	238,311	2,688,437	332,616	
Symes	766,637	153,858	416,452	104,704	
Victoria Park	665,294	108,436	1,430,243	127,379	
Dufferin	480,943	63,046	892,166	111,766	
Scarborough	910,572	146,644	1,190,943	174,581	
Commissioners	-	-	-	01,362	
Mech. & Elect. Maint.	452,188	79,204	62,477	-	
Constr. & Grounds Maint.	411,104	74,970	143,124	-	
Equip. Replacement Reserve	-	-	1,329,627	-	
Admin. and Insurance	135,405	18,245	147,092	-	
	7,894,272	1,520,755	11,747,051	1,307,351	16.03

The above figures do not include cost of capital financing.
Source: Metro Works Department Refuse Disposal Division - Annual Report 1988

TABLE 5 - 3
AREA MUNICIPALITY SHARES OF DISPOSAL COSTS

AREA MUNICIPALITY	1988 POPULATION NUMBER	1988 POPULATION % OF TOTAL	APPROX. % OF TOTAL METRO LEVY	SHARE OF NET REFUSE DISPOSAL EXPENDITURE (INCL. CAPITAL)
EAST YORK	96,497	4.5	3.04	656,330
ETOBICOKE	293,433	13.8	14.62	3,156,430
NORTH YORK	544,460	25.5	23.21	5,010,994
SCARBOROUGH	470,406	22.0	15.70	3,389,600
TORONTO	597,126	28.0	40.04	8,644,558
YORK	131,537	6.2	3.39	731,894
TOTAL/(AVERAGE)	2,133,459	100.0	100.00	$21,589,806

SOURCE: METROPOLITAN TORONTO WORKS DEPARTMENT SOLID WASTE MANAGEMENT DIVISION, 1988 ANNUAL REPORT

TABLE 5 - 4

TOTAL EXPENDITURE - 1988

Administration	$ 629,167
Incineration	2,704,780
Mechanical & Electrical Maintenance	1,234,652
Landfill	17,121,082
Construction & Grounds Maintenance	1,476,991
Transfer Station	18,108,641
Recycling	1,482,349
Equipment Replacement Reserve	3,409,300
	$46,166,962
Capital from Current	9,827,800
Capital Debt Charges	11,018,251
Total Cost of Refuse Disposal	67,013,013
Revenue	45,423,207
Net Expenditures (Against General Taxation)	**$ 21,589,806**

(Expenditures are latest available at time of printing and not necessarily final.)

As of October 31, 1989, the remaining capacity of Metro's two landfills was determined to be:

Keele Valley:	10,831,000	tonnes
Brock West:	663,000	tonnes
TOTAL:	11,494,000	tonnes

Based on these capacities and on rough forecasts of the amount of solid waste to be received at these sites, it can be concluded that Brock West will run out of capacity in Autumn of 1990; and if waste from eastern Metro is then directed to Keele Valley, Keele Valley will run out of capacity in the Summer of 1993.

6.0 POTENTIAL WASTE MANAGEMENT SYSTEM COMPONENTS

6.01 Introduction

This section presents a discussion of the types of programs and facilities likely to be included in Metro's master plan. Further details on individual components are presented in Appendix "C".

6.02 Reduction and Reuse

Reduction and reuse programs and initiatives are designed to prevent the generation of waste at source and are the first priority in the management of solid waste. Historically, waste generation per capita in Metro has grown over the period 1979 to 1988 by 1.3% per year. It is Metro's goal to reduce per capita waste generation; halting the growth would represent a decrease in waste generation from the current trend by 14% by the year 2000.

As the first priority in the management of solid waste, reduction initiatives must be undertaken to reduce the quantity of waste requiring management by other more costly and less environmentally acceptable approaches. Metro's approach to the 3Rs is outlined in the "Waste Reduction and Recycling Plan" (December 6, 1988). The Plan, included in Appendix "B", outlines 37 steps that will be taken to divert 30% of waste from disposal by landfill by 1992.

A report prepared by the Canadian Institute for Environmental Law and Policy for Metro entitled, "A Regulatory Agenda For Solid Waste Reduction" (Discussion Paper No. 1.3, June 1989) outlined many initiatives that can be considered in the short and long term.

Some examples of the programs and initiatives that Metro can implement to reduce, reuse and recycle waste are as follows:

- Establishing and implementing programs within its current jurisdictional responsibility such as:

- establishing higher tipping fees to encourage at source waste reduction, reuse and recycling
- sponsoring public education programs
- banning reusable and recyclable wastes from landfill
- adopting a comprehensive purchasing/procurement policy
- charging waste generators by container collected to reduce waste at source
- assisting industry in evaluating ways and means to reduce or reuse production materials so that waste is not generated
- extend use of diversion credits

■ Initiating legislative amendments within its jurisdictional responsibility such as:

- requiring mandatory private sector recycling
- establishing a solid waste manifest system to target reusable and recyclable wastes by specific industry generation source
- requiring mandatory industrial waste audits

■ Requesting provincial and federal governments to take actions that would result in the reduction and reuse of solid waste such as:

- reducing the quantity of product packaging
- establishing container deposits that significantly increase the quantity of materials that are reused
- establishing financial incentives to discourage excess packaging
- implementation of product performance standards to ensure products can be recycled

Some of these items have already been initiated. The continued application of these programs is intended to have the effect of changing the behaviour of Metro's population to reduce per capita waste generation.

6.03 Collection Systems

It is important to recognize the key role of waste collection in maximizing materials recycling. Metro does not control collection of waste directly, but depends upon the delivery of waste to its facilities by the area municipalities and private haulers. Hence, when new Metro facilities are in operation, Metro may be required to specify the type of waste and the manner of its delivery to the new facilities.

There are now stipulations in force on the acceptability of wastes such as:

- specification of materials to be collected by the Blue Box collection programs,
- restrictions on the amount of corrugated cardboard permitted at Metro facilities,
- bans on leaves and white goods.

Under the alternative systems, the collection of residual waste would evolve in one or, at most, two steps so that waste is delivered by the area municipalities to facilities that accept waste of specified character. For example, composting plants would accept only segregated material suitable for composting. A detailed specification would be developed with which users of the facility would have to comply. Similarly, facilities that accept material from which recyclables are sorted would have another specification.

After acknowledging the key role of waste collection and delivery, the task was to determine methods and types of collection systems that would achieve source separation. At this stage of the study, two systems are being considered, each of which appears to be able to achieve the desired results. They are:

- a "three-stream" system,
- a modified version of the "wet/dry" system used in parts of Europe.

None have been tried in North America at a Metro scale but both appear promising.

The three-stream approach involves collection of residential waste in three fractions: specified recyclables; specified compostable organic material; and mixed waste. Households would need three containers. Key issues in this approach are: public response to the use of three containers; the required level of detail in the specifications for the recyclable and compostable fractions; the availability of the mixed waste stream which may increase non-participation.

A modified wet/dry collection system would involve collection of materials in the following streams:

- wet (e.g., kitchen wastes) and dirty (e.g., disposable diapers) wastes
- paper and cardboard
- other clean (e.g., plastics and glass) and dry (e.g., textiles) waste

Such a collection ensures that all material is directed to an appropriate processing centre to achieve the high potential for recovery. The separation criteria are simple and understandable, reducing the extent of unintentional cross-contamination. Extensive public education programs would be instituted, as well as some incentive or enforcement programs, to promote the highest degree of co-operation with the source segregation requirements.

The cost of the collection of waste under such a specification will be somewhat higher than the cost of traditional garbage collection. However, the cost will be substantially less than the further extension of the Blue Box approach using additional collections and multiple compartment vehicles. The collection of waste in a comparable fashion is undertaken in Europe.

Collection of the three components in the wet/dry system could be performed by two collections each week. For example, paper and cardboard could be collected in one collection, and wet waste and other clean dry waste could be collected in a two-compartment vehicle in the second collection. (Bulky waste would still be collected in a special collection on an infrequent basis).

This arrangement would keep the number of collections to the level experienced before the introduction of the Blue Box collections. This will reduce traffic and pollution impacts. The level of service will not, however, be significantly curtailed.

Commercial and industrial waste would be required to conform to standards of acceptability for delivery to Metro facilities. For example, waste delivered to a compost facility would be restricted in terms of the maximum proportion of non-compostable material.

Satisfactory source segregation of waste is ultimately crucial to the achievement of Metro's diversion goals.

6.04 Transport and Transfer

In addition to the actual collection of waste, it is expected that Metro will continue to operate a network of facilities to permit receipt and transfer of waste to processing facilities. It is not likely that a system will be devised so as to have enough waste sorting and composting plants close enough to each part of Metro to permit direct haul (i.e., without using transfer stations).

Existing transfer stations could be adapted to maintain appropriate source segregation of collected materials. Some of the existing stations may also become sites for some of the new facilities, permitting some direct haul of appropriate waste to the facility. A waste sorting or composting facility site may also provide transfer capability for waste of other specifications.

6.05 Recycling

The term "recycling" is used to cover a range of activities in which materials are extracted from the waste stream to be sold as raw materials. The specific recycling initiatives include:

- continuing the Blue Box collection and materials processing program in the short term with extension to multiple family dwellings, schools and some commercial establishments;
- developing facilities for sorting recyclable materials from mixed dry waste;
- recycling of white goods, and other recyclable bulky residential waste;
- increasing tipping fees at Metro facilities to provide the required diversion incentive to support recycling efforts by private waste management and recycling companies;
- establishing source separation of office paper and other recyclable materials at Metro and municipal boards, agencies and commissions;
- adding a requirement to the building permit process to ensure all new buildings make provision for source separation of materials;
- banning from Metro facilities wastes containing certain specified recyclable materials in concentrations greater than 20% as markets become available.

Candidate "banned" materials identified are:

corrugated cardboard	(effective now)
large appliances	(effective now)
tires	(effective Jan. 1, 1990)
leaves	(effective now)
wood wastes	
demolition and construction wastes	
drywall wastes	(effective Spring 1990)

- requesting the Province of Ontario and the Government of Canada to establish, expand and promote office paper recovery programs at all their offices in Metro as well as programs to recover other materials;

- requesting MOE to establish target dates for the banning of recyclable materials from disposal facilities (landfills) throughout Ontario as markets become available as a means of supporting market development;

- implementing public education programs regarding Metro recycling programs to ensure citizen awareness and co-operation;

- adopting a comprehensive procurement policy for Metro (and other governments) that gives preference to products with recycled content;

- providing waste audit and waste exchange services to industries to assist them to recycle industrial waste.

Several of these programs have been implemented and others are currently under development. In terms of large-scale recycling, the key programs are the development of sorting plants, bans on recyclable materials at Metro facilities and the maintenance of high tipping fees.

The design of sorting plants for mixed dry waste would be an extension of the technology developed for sorting mixed recyclables now collected in Blue Box programs. Such facilities are sometimes referred to as materials recovery facilities (MRF).

Sorting plants are currently used in a number of European communities to sort dry mixed waste. A review of existing plants indicates that:

- they are typically of smaller scale than would be required in the Metro context,
- they are labour intensive,
- the working conditions in many are unacceptable to North American labour,
- the yield and quality of recyclables is below North American expectations.

Sorting plant technology is relatively new even in Europe. The earliest plants were built in 1982. More recent plants show considerable progress in:

- reducing the amount of labour required,
- improving working conditions, and
- increasing plant through-put.

Developments in MRF technology in the United States suggest that considerable increases in performance may be achieved by keeping paper and cardboard separate from other material. Applying this to the European dry sorting plant approach leads to the need to specify collection of dry materials in two fractions: paper and cardboard and all other dry waste.

Paper and cardboard constitutes about 40% of residential waste by weight and volume. The separation of recoverable paper in an MRF would be done by hand, with only concentrated or high value paper being picked, specifically newspaper, corrugated cardboard and some fine paper (e.g., computer paper).

Other dry waste is expected to amount to about 30% by weight or 45% by volume of residential waste. This would include container materials such as glass and plastic bottles and jars, cans, plastic and miscellaneous dry waste. Some of this material can be sorted mechanically. Some would have to be picked. Other material would remain as residue. Separation technology to further reduce labour and increase productivity is expected to develop as prototype plants are built and operated.

Markets for additional materials need to be developed. For example, there is currently no market large enough to absorb the quantity of mixed paper that could be collected and separated. In fact, it appears that the value of the mixed paper as a fiber source may never make it attractive as a raw material for the paper industry. The mixed paper may find other applications such as chemical feedstock for cellulose and cellulose driven chemicals, production of alcohol or sugars, etc. Achieving high diversion levels will require development of new markets.

It is proposed that a prototype dry waste sorting plant of about 190 tonnes per day be constructed by 1991. This could serve as a pilot/demonstration plant that would allow development of a standard approach for the design and operation of subsequent plants and for market development.

It is anticipated that there would be a continued process of technology development. There would also be continued market development, both to extend the range of materials that can be marketed and to respond to changes in market requirements. For example, changes have recently been made in the requirement for colour separation of glass. Plastics markets may vary in their demand for separated polymers or mixed plastic.

Sorting plants would also be able to accept specified waste from commercial and industrial sources. Haulers delivering to the plant would have to meet the same specifications as municipalities. Experience in Europe is that commercial and industrial sources of waste make up a significant part of all the material processed by sorting plants. The same is expected to be true in Metro.

The nature of commercial and industrial waste requires a different approach than for domestic waste. Collection is not under municipal control and waste haulers and other private firms may be perusing opportunities to divert waste from Metro facilities to private recycling ventures. It may be in Metro's interest not to compete with the private sector, particularly if Metro finds that it must operate on a subsidized basis.

High tipping fees provide motivation to the generator to source separate and recycle materials. Generators will avoid Metro facilities where the cost of source separation is modest and there are buyers to accept the material at a charge lower than municipal tipping fees. Metro would continue to provide information on market opportunities for recyclable materials.

Bans not only prevent the disposal of recyclable material but also provide the needed assurance to industry that a sufficient quantity of material will be available for collection or marketing. The establishment of bans requires that a number of conditions be met:

- the existence of markets large enough to consume the quantity of resulting material;
- the existence of proponents prepared to guarantee to accept all the banned material;
- the ability of the proponents to accept the banned material at a fee comparable to or below Metro's prevailing tipping fees.

When these conditions exist, Metro should establish bans on the appropriate recyclable materials.

6.06 Composting

Composting of organic waste can divert waste from landfill and/or incineration while producing a useful product. The desired compost product determines the choice of material fed to the process and the ultimate role of composting in the overall waste management system

Metro established a pilot backyard composting scheme in 1989, with over 19,000 composting units distributed. The users of these units will be surveyed to establish the effectiveness of the program. If this approach proves effective, continued provision of composting units at some level of subsidy is proposed to encourage further backyard composting. Education and promotion programs are proposed to increase participation levels.

To the maximum extent practical, backyard composting of food and yard waste must be encouraged and supported by Metro. Backyard composting avoids collection and processing of the material by the area municipality and Metro respectively. This reduces collection costs. The fact that the finished product is used on site by the homeowner avoids the need for the public authority to market the product. Backyard composting is considered a waste reduction program.

Not all residents will choose or be able to compost their organic wastes. Consequently, it is proposed that provision be made for the separate collection and composting of organic waste from households and the receipt of organic wastes from some commercial and industrial sources.

A second composting program now operational is centralized leaf composting; Metro expects to compost 30,000 - 40,000 tonnes of leaves in 1989. This program has been reinforced by a ban on disposal of leaves at Metro landfills and a media campaign to encourage participation.

In terms of large-scale organics composting, Metro has approved the preparation of a pre-design report of a 190 tonne per day composting facility for segregated organic material received from commercial and industrial sources. This is intended to demonstrate large-scale composting, provide a basis for determining the characteristics of the finished product and establish marketability.

Recent European experience has shown that the quality of compost derived from mixed waste is not marketable. As a result, there has been a growing trend to composting only selected or segregated organic materials (food and yard waste). The resulting product is designated "green" compost as opposed to the "black" compost that is produced from mixed waste and (sometimes) sewage sludge. The green compost is marketable because it meets regulations dealing with levels of heavy metals and other contaminants.

Metro recognizes that contamination problems could arise from composting mixed waste or including quantities of printed papers and plastics in the waste feed. Although the physical appearance of the finished product may be satisfactory, high levels of heavy metals severely restrict or eliminate potential applications and acceptability of the product. For this reason, the feed to centralized composting plants will be restricted wherever possible to food and yard wastes with low levels of contaminants.

Notwithstanding the above, composting of mixed waste is useful as a waste processing technique because it can: reduce the volume for landfill disposal by up to one third; reduce gas generation in the landfill; and the product can be used as cover material (further avoiding use of landfill capacity).

Organic material for "green" compost will be obtained via the wet waste residential collection. This material collected from households will be predominantly food and yard waste, although it will also likely include such material as disposable diapers, vacuum cleaner catch, floor sweepings and soiled paper, cardboard, plastics, etc. When the composting plant is operating, it will be possible to determine the extent to which such materials can be removed from the finished product.

Even with adequate control of feed and the production of an acceptable product, the use of compost would have to be expanded significantly to accept the quantity capable of being produced. Market development will take time and effort and is a further reason to concentrate initially on a smaller quantity of higher quality and readily marketable product.

As a backup to commercial compost markets, Metro should arrange with municipal and government agencies to accept compost for spreading on public land such as road verges, parks, etc. Such a market of last resort would help ensure that no useful product is landfilled.

When the operation of the 190 tonne per day plant has been established (including supply arrangements and demonstration of the marketability of the product), the plant could be increased in capacity to provide 500 tonnes per day of capacity. This additional capacity would be supplied with segregated residential waste. Additional capacity can be built in 500 tonne per day units.

Siting for large-scale compost operations requires about 12-15 hectares for each 500 tonne per day facility. A site selection process has not been completed for compost plants; however, possible sites under investigation for the 190 tonne per day plant include current and former Metro landfill sites.

6.07 Fuel From Waste

One of Metro's objectives is to seek the highest and best use for all diverted materials. However, some materials do not have recycling opportunities either because the market is not large enough or because the materials cannot meet "the market's" current specifications. Some of these materials are high-energy-content wood wastes and tires, which can be used as fuel.

Wood and tire waste can be used as a fuel substitute for fossil fuels in relatively high efficiency burners. If these materials are not recovered as fuel, they could be incinerated if sufficient capacity is available. Otherwise, these materials would be landfilled.

It is possible that the diversion of these materials to fuel use may lead to the establishment of collection and processing systems that would make the materials available for other uses as well and, hence, could lead to the creation of markets for uses other than fuel. It is also possible that these other markets would drive up the prices so that it would not be feasible to burn certain "wastes".

6.08 Incineration With Energy Recovery

Incineration can reduce the quantity of waste requiring landfill and is a disposal approach that can be used within Metro boundaries. It also provides an opportunity to extract usable energy from residual wastes after all recyclable and compostable material has been removed. The resultant ash does not generate gas at the landfill site and is not subject to as significant settling as is mixed waste. In an ashfill site, the leachate would be controlled and treated.

It is important to emphasize that the only materials sent to incineration would be residues or rejects from sorting and composting operations, or combustible material that is unsuitable for either of these operations. The residual wastes are expected to have a high energy value.

In the past decade, improvements in incineration technology have been made to meet stringent air emission standards. The residue materials feedstock is expected to have a higher heating value, lower moisture content and lower ash content than conventional incinerator waste feed. While this is likely to improve combustion conditions leading to a hotter, cleaner burn, many current incinerator systems will not cope with these high heat, high temperature conditions; care must therefore be taken in the design of incineration facilities.

Incinerator ash, particularly the fly ash, will require testing to determine if special disposal treatment is required.

Incinerators could be sited on vacant heavy industrial land in Metro. The site selection process should ensure minimization of traffic, land use and air impacts. The lead time for siting, design, approvals and construction is expected to be about six or seven years. Each incinerator would have an expected lifetime of at least 20 years. At the end of this time, a new incinerator could be established on the same site or, if incineration is no longer required, the site could revert to other use.

An alternative to incineration would be the preparation of RDF from residual materials for use in facilities such as cement kilns. This differs from conventional incineration in that the waste feed is a mixture of combustible materials that may not burn as cleanly or consistently as single material type waste, requiring a higher standard of combustion and air emission control than normal fuel burners. The market potential for RDF is limited by the number of facilities suitable to accept this product.

6.09 Landfill

In the long term, landfill will be the disposal alternative of last resort. At a minimum, landfills will receive ash, non-combustible residues of other processes (sorting and composting facilities) and non-recyclable, non-combustible waste. The character of waste landfilled will be substantially different than that received currently. The waste will have less of an organic fraction and, hence, will generate relatively little methane gas. Much of the material will be inert and may have little leachate toxicity.

This long-term situation is projected to develop over the next 20 years. During this time, substantial conventional landfill capacity will be required. Planning is required for sufficient landfill capacity with the capability of accepting conventional waste, especially to serve as back-up if recycling and/or compost markets do not develop as quickly as hoped.

Landfill is the most flexible of all waste management approaches as it is not sensitive to changes in waste composition or quantity. Popular or not, it is an essential component of any waste management system giver available and foreseeable technology.

6.10 Research and Development

It is recognized that some waste management technologies are not yet fully developed for use on a Metro scale and that further development work is required if these approaches are to meet their full potential.

Two broad areas requiring development can be identified:

- waste processing - collection technology, sorting plants, composting, etc.
- markets - novel uses, materials properties, etc.

Development of waste processing technology would proceed in a number of areas.

Improving collection technology would involve working with manufacturers to design vehicles that can cope with the segregated waste stream. Multi-compartment vehicles with variable compartment size, packers with adjustable compaction pressures and loading equipment to increase productivity while reducing risk of worker injury are areas to pursue.

Sorting plants could be upgraded to increase throughput and automation, improve working conditions and improve the quality of materials produced. Operational plants can provide opportunities to introduce new equipment and methods. For this reason, at least one plant should be designed with spare capacity to permit experimentation. All plants should be designed with flexibility in mind.

In composting plants, the relationship between input feed material and end product characteristics will be constantly monitored. The results of monitoring of the feed may cause waste managers to implement changes in the waste stream needed to maintain compost quality and, hence, changes in waste collection may be required.

Over time, a capability can be developed to adjust input feed by selecting sources, screening or separation of material within the plant or by different post-compost treatments to obtain the desired output. The compost could be processed to various specifications to meet specialized market requirements.

Energy recovery technology may be extended to include other approaches such as pyrolysis. While it is not anticipated that Metro would engage in any direct research and development work in this area, co-operation with others may be appropriate. Certainly a continued monitoring of developments should be maintained.

Much of the success in reaching Metro's diversion targets relies upon finding buyers or users for material currently being landfilled. In the year 2000, markets will be required for close to 1.5 million tonnes of material that today are being landfilled. Markets of this size are not currently available. As well, other market problems such as temporary gluts will occur at times with many materials. In the long term, the production of reliable quantities of materials of consistent specification will provide a foundation for the development of markets.

There remains some material for which there is no clear prospect for use at the scale required to meet Metro's goals. These include mixed waste paper and mixed plastics. Both of these materials have properties that have some use as a raw material. There should be continued pursuit of and co-operation with potential users to develop applications that are economically viable. For example, markets may have use for the following properties of mixed paper:

- physical values - absorbent and insulative; as animal bedding, insulation, packing material etc.
- fiber value - short, weak fibers with substantial glues, inks, dyes, fillers
- cellulose value - as a raw material or as an additive to other materials or as a filler
- chemical value - as a source of sugar, alcohol or other chemical derivative

There are currently no markets for all of the potentially available mixed waste paper that can use these four properties (in waste mixed paper).

Funding for the research and development described above could be provided jointly by Metro, the Province and private enterprise. Metro could raise its share from tipping fees. Actual work could be undertaken as appropriate by: Metro staff; private industries with an interest in developing marketable; licensable technology; or private or public research agencies.

6.11 Summary

This section has presented a discussion of the types of components that are available for waste management.

Systems will be developed wherein waste reduction programs are of first priority, after which waste (that is generated) is first exposed to enhanced recycling or composting opportunities before being processed for material or energy recovery.

Thus, at this point, the following waste management approaches are still under consideration:

1. Reduction & Reuse (not requiring direct management by Metro).

    ■ Reduction by:
    - public education *
    - packaging changes
    - backyard composting *
    - procurement policies *
    - incentives
    - industrial in-house changes

    * Metro is currently actively involved in these.

    ■ Reuse, including:
    - changes in household practices
    - commercial and industrial audits

  - container deposits

2. Recycling (requiring direct management by Metro).

- Recycling, including:
  - material sorting facilities
  - blue box program
  - wet/dry collection

- Composting, including:
  - leaf composting
  - dedicated organic waste composting
  - wet waste composting
  - mixed waste composting

3. Disposal (requiring direct management by Metro).

- Incineration, including:
  - with energy recovery
  - mixed waste feed
  - feed restricted to combustible residuals from higher priority approaches
  - production of RDF
  - residuals used as fuel

- Landfill, including:
  - mixed waste
  - restricted to residuals from higher priority approaches
  - restricted use

Based on these considerations, alternative systems have been developed to manage the estimated 71 million tonnes of waste forecast to require management over the planning period 1991-2010.

7.0 THE PRELIMINARY MASTER PLAN

7.01 The Need For a New Waste Management System

Sections 2 and 3 of this Discussion Paper are outlines of the legal and jurisdictional aspects that must be considered in developing a solid waste master plan and to implement a plan by establishing programs and facilities.

Discussions in Section 4 set out the estimated quantity of solid waste generated and managed in Metro. Forecasts were developed that indicate, that over the period 1991-2010, some 71 million tonnes of waste could be generated in Metro which require management.

Information provided in Section 5 documented that, no reasonable effort to the contrary, licensed disposal capacity at the two Metro landfills will be completely depleted by 1993. Further, the limited time frame available to full capacity at Brock West Landfill (less than one year) and Keele Valley Landfill (less than four years) means that even a major effort to reduce tonnages through reduction, recycling and other means will have limited impact on the estimated site life of these facilities.

Provincial and Metro targets are to divert from landfilling 25% of the waste by 1992 and 50% by 2000.

The Metro goals differ from the Province's targets in that Metro proposes to divert 30% of the waste now going to landfill by 1992. Metro believes that the need to develop and implement a new solid waste master plan with new programs and facilities is clearly evident and urgent. (Please refer to Appendix E.)

The discussion on potential waste management components, (Section 6) briefly set out the type of approaches potentially available to Metro to manage solid waste. These approaches were described as: waste reduction and reuse; waste recycling; composting; energy-from-waste; and landfill. Metro's long-term solid waste management system could include a combination of these programs and facilities.

7.02 Establishing a New Solid Waste Management System

As noted, the preceding sections of this Discussion Paper summarize the range of matters and responsibilities that must be considered in establishing waste management programs and facilities in Ontario. It is a complex planning, implementation and approvals process that is being addressed by Metro as follows:

- Alternative waste management systems targets are to be established to identify combinations of approaches available to Metro to manage solid waste for the long term. Alternative system targets are to be developed based on screening factors that establish minimum guidelines that must be satisfied;
- Alternative system targets are to be evaluated based on comparative factors. This evaluation would identify a measure of the relative advantages and disadvantages of system targets. The role (e.g., specific type, size, capacity and interrelationship) of waste management approaches are to be described;
- A preferred waste management system would be identified based on the comparative evaluation and an implementation strategy and schedule prepared. It should identify approaches and evaluation criteria for siting facilities, approval requirements and estimated scheduling leading to facility operation;
- Preferred waste management programs and technologies would be selected based on a comparative evaluation of specific alternatives potentially available for each approach comprising the preferred system. Appendix "D" includes a list of factors that could be used to develop specific criteria to complete the evaluation;
- Preferred sites for selected programs and facilities are to be identified;
- Approvals are to be sought and, if obtained, the preferred facilities established.

This Discussion Paper addresses those activities described above and identifies certain matters that will be considered for the other activities.

7.03 Guiding Principles

Before developing system screening factors, it is necessary to determine the needs, priorities and long-term objectives of the community. This has been approached through the SWEAP Public Participation Process as described in Section 3. It is an ongoing process that has produced some draft guidelines and policies that have been useful in developing system screening factors. These are:

- Metro Council, in April 1989, approved the following statement of policy:
    - Metro endorses the Provincial targets for waste diversion from landfill of 25% by 1992 and 50% by 2000 (based on 1988 landfill rates adjusted for population growth), with further reduction beyond 2000 to be established;
    - (It should be noted that further clarification of the meaning of the Provincial targets was received from the Minister of the Environment in a letter to the Metro Commissioner of Works dated July 27, 1989. In this letter, the target was stated as "fifty percent diversion of solid waste from landfill and incineration by the year 2000.... Therefore, energy-from-waste (EFW) incineration is not considered as a contributing factor to the 50 percent diversion". Thus, Metro Council has not, at this time, approved the Provincial targets as now understood. Text of the Metro Council decision and the MOE statements on diversion targets are presented in Appendix "E" to this report);
    - Metro will continue to implement all approved programs, activities, facilities, studies and pilot projects to meet Metro's waste diversion target of 30% by 1992;

  - Metro endorses the principle that the first components of its solid waste management plan will be reduction, reuse, recycling and recovery.

- Other possible elements of Metro policy are reflected in a Works Department draft policy statement submitted to Metro Works Committee on January 4, 1989 which is included in Appendix "E". These policies direct as follows:

  - Establish solid waste management programs and facilities in a socially, culturally, environmentally and economically acceptable manner;

  - Provide the basis for the management of solid waste for a minimum 20-year planning period and ensure adequate facilities are approved and available;

  - Maximize the diversion of solid waste from landfill;

  - Provide the necessary facilities and programs to divert a minimum of 40% of total solid waste generated over the 20-year planning period to facilities other than landfill;

  - Achieve the above diversion policies, to the extent possible within Metro's jurisdiction, through the following solid waste management methods in order of priority;

    - reduce the quantity of material becoming solid waste
    - reuse material for the same purpose
    - recycle, including material recovery
    - compost
    - incinerate with energy recovery

  - Establish a solid waste management system that is flexible and has adequate back-up;

  - Continue to manage non-hazardous solid waste, including sewage sludge, ash or process residuals. Management of liquid, hazardous, pathological and radioactive waste is not considered part of the Master Plan.

- The Multistakeholder Committee (MSC), a key element in SWEAP's public participation process, has also developed a statement of guiding principles. This statement put forward "a hierarchy of solid waste management options" (see Exhibit 3-2) similar in spirit to that described in the draft master plan policies and added the following items:

  - Establish continuous monitoring of the composition, volumes and sources of waste and the products of their disposition in order to evaluate programs and develop new ones;

  - Involve all residents and businesses in waste reduction efforts;

  - Ensure full public discussion of potential sites and of the short and long-term effects of each waste management facility.

These statements have influenced the development of 'alternative' solid waste management systems and the development of systems screening and comparative factors used to evaluate 'alternatives'.

Other elements on which the system screening factors are based include the preparation, dissemination and public review and comments of SWEAP discussion papers. For example, Discussion Papers 3.1 and 3.2 address the questions of available waste management technologies and of how alternative systems were developed. Discussion Papers 1.2, 1.3 and 1.4 provided support for the setting of waste reduction, reuse and recycling targets and programs. Discussion Papers 2.1

and 2.2 provided a basis for some of the evaluation factors related to landfill. The Appraisal Study (Dec. 1986) set out much of the framework and some of the evaluation criteria used to develop alternative systems.

7.04 Evaluation Factors

The purpose of evaluation factors is to provide a systematic means of selecting and assessing (evaluating) alternative solid waste management components and systems. The definition of these factors is key - all subsequent evaluations are based on the factors as defined.

Evaluation factors are derived from: consideration of Metro objectives and policies; understanding of the functioning of waste management systems; public input; environmental legislation (i.e., EAA, EPA); and provincial guidelines.

Factor formulation involves selecting significant indicators of a solid waste management system's ability to meet stated objectives (i.e., performance standards). System objectives are derived from Metro's statement of guiding principles, public input, statutes such as the EPA and the EAA and the waste management needs of the area. In addition, there are a number of system attributes common to all waste management systems that must be measured, such as cost efficiency, feasibility, flexibility and reliability.

Two types of factors have been developed based on the need to follow a step-by-step planning and evaluation process. These are 'system screening factors' which are used to select or reject alternatives; and system 'comparative factors' which are used to compare alternatives and determine the relative advantages and disadvantages of each.

System Screening Factors:

These factors are used to eliminate some waste management systems from further consideration. The following screening factors have been adapted from Discussion Paper 3.2 ("Long-Term Planning Analysis of Solid Waste Management System Options").

The system to manage Metro's solid waste must satisfy the following screening factors. The system selected for further comparative evaluation must:

- protect public health and safety and the natural environment;
- provide adequate waste management capacity to meet Metro's long-term needs for a minimum 20-year planning period. Approximately 71 million tonnes of solid waste will require management over the 20-year period 1991-2010;
- give priority to waste reduction, reuse and recycling (the 3Rs) initiatives in the development of system programs and facilities;
- meet Metro objectives to divert from landfill 30 percent of total waste generated by 1992 and 50 percent by 2000;
- meet provincial regulatory requirements;
- consist of those programs and technologies that can reasonably be expected to operate successfully on a Metro scale;
- provide opportunities for new, innovative, pilot and experimental solid waste management approaches that might assist in the long-term management of solid waste;

- utilize programs and technologies that minimize adverse impacts on the environment having regard for the broad definition of the environment provided in the EAA;

- ensure reasonable cost effectiveness to Metro and to area municipalities.

Three of these factors (giving priority to the 3Rs, meeting regulatory requirements and technologies that can operate on a Metro scale) may also be used to screen individual system components.

System Comparative Factors:

These factors are used to evaluate the alternatives resulting from the initial system screening. Comparative factors provide a measure of the relative differences between alternative systems and are used to identify preferences between and within the alternatives. The following are the comparative factors that could be used to evaluate alternative systems:

- What percentage of solid waste would be managed by a variety of reduction, reuse and recycling approaches?

- To what degree are Metro's diversion of waste objectives achieved? What is the percentage of solid waste managed other than by landfill?

- To what degree are provincial waste diversion targets achieved? What is the percentage of waste diverted from landfill and incineration/EFW?

- Can the system manage solid waste by programs and facilities located within Metro? What is the maximum percentage of solid waste that could potentially be managed within Metro's boundaries?

- What programs and technologies included in the system produce residuals that require treatment or further management? What are they and in what quantity?

- What is the "total" cost of the solid waste management system?

- What system components have special operational needs?

7.05 Development of Alternative Systems

Section 6 and Appendix "C" to this Discussion Paper present a discussion of the types of components that could comprise the waste management system alternatives. There are many different combinations of the various approaches that are available to Metro.

As noted, Metro's objectives and policies and available waste management technologies are to be considered in identifying alternative systems that represent combinations of component facilities and programs that can manage the estimated 71 million tonnes of waste forecast to require management over the planning period 1991-2010. The approach to the development of alternative systems considered the following 'model':

- The broad range of waste management approaches that are categorized as waste reduction and reuse, waste recycling, composting, energy-from-waste and landfill;

- The type and quantity by type of Metro's waste that could be managed by each waste management approach; and

- The potential trade-offs involved in the choices (e.g., landfill versus incineration, compost quality versus compost quantities) and percentages of waste likely to be managed by each approach.

For evaluation, the year 2000 was selected as the base year to present each combination of approaches.

Using this "model", the consultants developed arithmatic computer programs to embrace the whole host of information and experience developed by Metro and the consultants. Typical "information" was:

- waste quantity projections allowing for waste reduction
- probable waste composition based on old and new information
- possible and probably material reuse and recycling opportunities
- energy content of the waste
- organic content of the waste
- chemical complexity of the waste
- system components available for a Metro scale system

The consultants produced a number of alternatives for discussions with Metro Works, the SWEASC (Metro's SWEAP steering committee) and then formulated three reasonably typical alternatives that pass the screening factors discussed above for presentation and discussion in this Paper.

Alternative System No. 1, after 14% reduce/reuse of waste, relies upon a maximum effort in recycling supported by compost first and landfilling second.

Alternative System No. 2 is the same as Alternative System No. 1 except that all combustible waste, that would be landfilled in No. 1, is burned in EFW/incineration facilities.

Alternative System No. 3 relies on the same 14% reduce/reuse effort in No. 1 and No. 2 but processes more through EFW/incineration facilities than No. 2 and in so doing reduces the roles for recycling and composting.

It should be noted that these systems do not exhaust the possible combinations or variations that can be developed but represent reasonable approaches to the problem. The alternatives use essentially the same components (reduction, recycling, composting and landfill with varying amounts of incineration/EFW).

Over the 20-year period, the proportion of waste diverted from landfill and EFW for each of three alternatives, may be summarized as follows:

PROPORTION OF WASTE DIVERTED FROM LANDFILL AND EFW
By Years 1995 - 2000 - 2010

	Alternative No. 1 *	**Alternative No. 2 ****	**Alternative No. 3 *****
DIVERSION FROM DISPOSAL (i.e., Landfill/EFW)			
1995	48%	48%	39%
2000	58%	58%	49%
2010	63%	64%	56%
TO DISPOSAL			
Energy-From-Waste			
1995	0%	0%	0%
2000	0%	24%	32%
2010	0%	20%	27%
Landfill			
1995	52%	52%	61%
2000	42%	18%	19%
2010	37%	16%	17%

* Alternative System No. 1 - high diversion without EFW
** Alternative System No. 2 - high diversion with moderate EFW
*** Alternative System No. 3 - moderate diversion with high EFW

The components of these three alternative systems are presented for the year 2000 in **Exhibit 7-1** overpage.

Detailed year-by-year development for each alternative system over the 1991-2010 period is presented in Appendix "H". Pie-charts showing the components of each alternative in the year 2000, are presented as **Figure 7-2**.

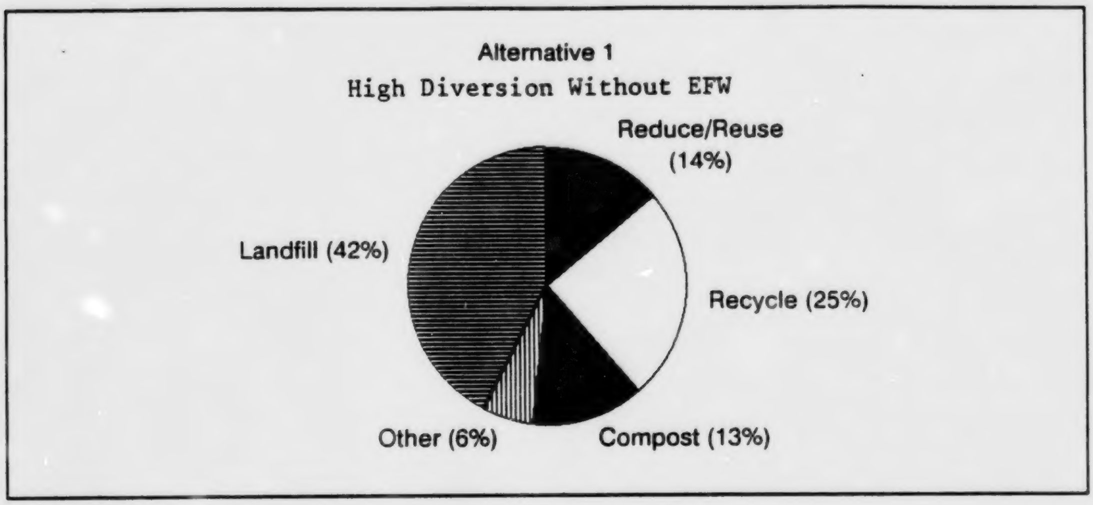
EXHIBIT 7-1
A COMPARISON OF ALTERNATIVE SYSTEMS BY PERCENTAGE OF TOTAL WASTE HANDLED
(YEAR 2000)

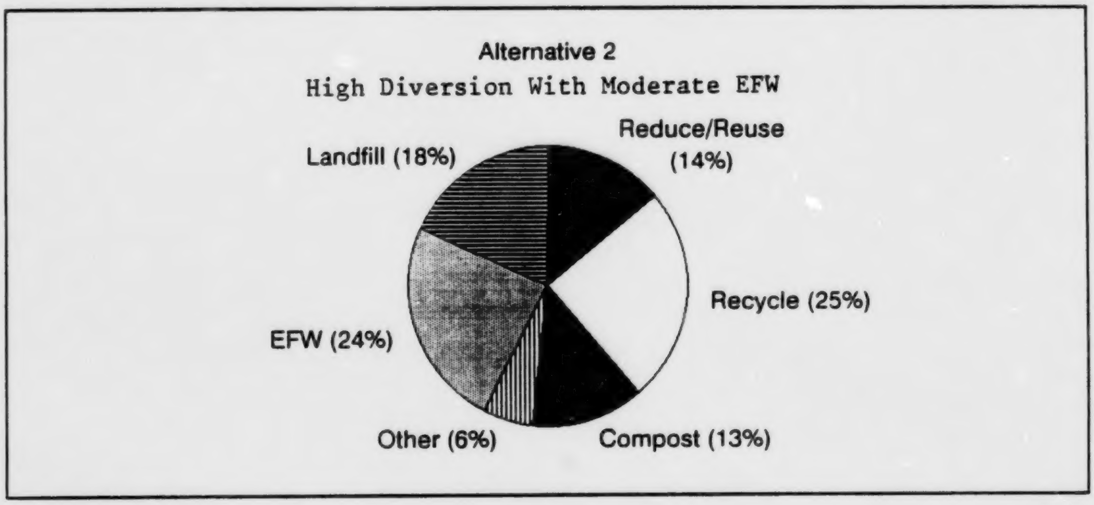
	Alternative No. 1 *	**Alternative No. 2****	**Alternative No. 3 *****
REDUCTION AND REUSE - Public Education - Packaging Reduction - Industrial In-House Changes - Backyard Composting - Procurement Policy - Incentives - Container Deposits	14%	14%	14%
RECYCLING - Blue Box - Separate Collections - Industrial Audits - Bans	25%	25%	19%
COMPOSTING - Leaf - Dedicated - Wet/dry - Mixed	13%	13%	10%
OTHER - Sewage Sludge - Tire and Wood Waste as fuel	6%	6%	6%
ENERGY FROM WASTE	0%	24%	32%
LANDFILL	42%	18%	19%
Total	**100%**	**100%**	**100%**

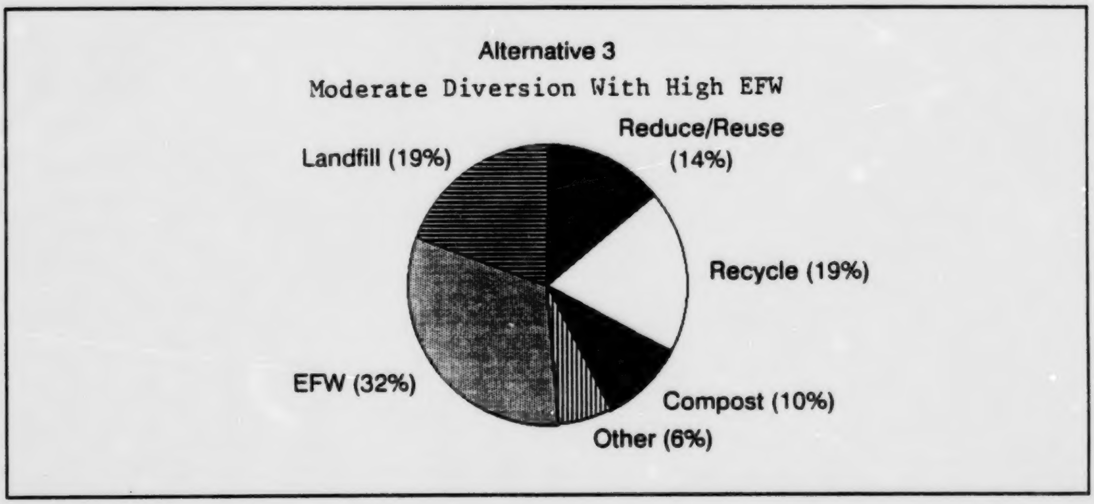
* Alternative System No. 1 - high diversion without EFW
** Alternative System No. 2 - high diversion with moderate EFW
*** Alternative System No. 3 - moderate diversion with high EFW

FIGURE 7 - 2

System Targets For Year 2000







7.06 Observations on Alternative Systems

The three Alternative Systems represent different combinations of programs and technologies (i.e., system components) that could be used to manage the non-hazardous solid waste generated in Metro. Since there are differences between the alternatives, choices must be made, some of which are obvious and others that require consideration of trade-offs.

Probably the most difficult of all choices are those to be made for sites for waste management facilities within the boundaries of Metro. For example, there are limited siting opportunities for landfills within Metro because of the significant area of land required for each. The siting of an EFW facility must first have regard for air quality factors. Compost facilities will probably have fewer siting constraints compared to landfills and EFW plants. However, odour and traffic matters must be fully addressed in selecting sites for composting. Materials recovery plants probably have the fewest siting constraints since these facilities are similar in many respects to light industrial plants.

The need for landfill capacity has been identified for each of the three Alternative Systems. Depending upon the make-up of the preferred Metro system, landfill could have a variety of roles. For example, in Alternative System No. 1, 42% of the waste would go to landfill. In this system, the waste to be landfilled would be those wastes which remain after recycling, composting and which are combustible. If EFW is selected as a system component (in Alternatives No. 2 and No. 3), then the type of waste to be landfilled will be different and the landfill capacity could be less than for System No. 1. Further, if EFW capacity is as large as suggested in System No. 3, then the amount of waste available for recycling and composting would decline to the point where provincial Ontario "targets" for diversion from landfills and incineration will not be met.

The need for landfill capacity in the near future was determined and noted in Metro's 1986 "Appraisal Study". There are those that support establishing landfill capacity larger than the capacity deemed as the minimum necessary in the system selected. Planning for a larger landfill capacity may be necessary because of the transition period when other types of new facilities are being established. There may be equipment failures and forced plant shutdowns, or reductions in markets for recycled material. Opponents to any plan for landfill capacity over and above minimum planned needs suggest that the extra landfill capacity, once established, could or will deter planning and implementation of 3R's programs and facilities.

The cost to Metro to implement and operate the various types of facilities must be considered when comparatively evaluating them. For example, the reduction programs, the first 2"Rs" of the 3"Rs", would result in little or no cost to Metro, and Metro's responsibility in the reduction programs would only be indirect. Set out below are general comments about the cost to Metro and Metro's responsibility for implementation of the system components being considered.

	Metro's Cost	Metro's Responsibility
Reduction & Reuse	little or none	- provision of incentives - education - backyard composting
Recycling	high	- separate collection - sorting facilities
Composting	moderate	- separate collection - composting facilities
Energy from Waste	high	- EFW facilities
Disposal by Landfill	moderate	- landfill facilities

The following are examples of some of the considerations and types of trade-offs that might arise in the development of Metro's long-term waste management system:

- If the emphasis is to maximize the diversion of waste from landfill then it appears that more than one (and likely more) EFW facilities will be required.

- If the emphasis is to maximize the diversion of waste from both landfilling and incineration, Metro will be required to place reliance on waste management approaches that are emerging, innovative or pilot and that have not been successfully demonstrated to operate on a Metro scale.

- If it is decided to place a high dependence on currently proven technologies, the result will be a system which depends more on landfilling and EFW. The implementation of landfill and EFW in those circumstances may be at the expense of 3R's and composting programs.

- If higher diversion rates from landfill are sought, then higher total system costs will be the result. If landfills are used for a larger quantity of waste, then total system costs would be lower. However, Metro and provincial diversion targets may not be met.

- If the increased use of composting is contemplated, then the Area Municipalities will require different collection and processing approaches to ensure the quality for the compost product. The more types of waste that are composted, the greater likelihood that the compost product will be too contaminated to be used widely.

- If EFW is not given a role in the system, then for the first years at least, more waste will be landfilled because recycling, as it is constituted now, cannot currently deal with all of the wastes that otherwise could be directed to EFW. If EFW is given a major role in waste management, the result would be a more complex and capital-intensive system with relative inflexibility. This is because an EFW facility requires a relatively constant rate of waste supply throughout its life. This feature of EFW could reduce the need for the development of an increased role for recycling and composting.

- If EFW is selected, then stack emission and ash problems must be dealt with. While current stack-emission cleaning technology has been proven, the fly ash and, in some cases, the bottom ash resulting from burning solid waste may require expensive special handling.

- If it is decided to recycle more or different types of mixed waste paper, improved capacity may be required in existing municipal waste water treatment facilities to deal with the higher organic and heavy metal loadings and suspended solids in the water effluents from paper making. More complex sewage sludge management programs may also be required.

- Heavy commitments to new and higher levels of recycling and composting must also consider markets. Larger and more diverse markets than now exist for recyclables will be required to receive the materials. While markets for present "Blue Box" materials are fairly well established, markets for plastics and lower paper grades are not. Similarly, the market for compost is not developed. Inability to sell the compost and recyclable material could pose financial constraints that could result in the landfilling of these materials. During recessionary periods or when raw material prices are low, there may be little demand for the materials produced by the recycling components of the solid waste management system. This will affect system finances as well as landfill capacity. As well, certain technologies that might, in the future, permit recycling to reach the levels set out as targets are not yet proven. (Note that recycling rates proposed in all three Alternative Systems will be possible only when new technologies and markets are developed and proven to be reliable).

7.07 Comparative Evaluation of Alternative Systems

The final and detailed comparison of the three Alternative Systems presented herein is beyond the scope of this Discussion Paper. In fact, it cannot be completed until public review and input on this Document has been completed. However, the reader is invited to consider the suggested comparative factors discussed in Section 7.04, and then review the highlighted differences between the Alternatives on **Exhibit 7-3**. Further, included in this document as Appendix G, is a summary of the various approaches to solid waste management.

Exhibit 7-3
Preliminary Comparison of Alternative Waste Management Systems at the Year 2000 Using Comparative Factors

Comparative Factor	Alternative No. 1 High Diversion Without EFW	Alternative No. 2 High Diversion With Moderate EFW	Alternative No. 3 Moderate Diversion With High EFW
What % of Waste is Managed by Waste Reduction, Reuse and Recycling Approaches?	58%	58%	49%
What % of Waste is Managed by Non-Landfill Approaches?	58%	82%	81%
What % of Waste is Diverted from Landfill and incineration/EFW?	58%	58%	49%
What is the Maximum % of Waste that could Potentially be Managed within Metro Boundaries?	58%	82%	81%
What Programs & Technologies Produce Residuals Requiring Further Management?	Landfill (leachate, landfill gases, stormwater)	Landfill (leachate, landfill gases, stormwater) incineration (ash and air emissions)	Landfill (leachate) landfill gases, stormwater) incineration (ash and air emissions)
Does the system include proven technologies, demonstrated on a Metro scale and with a history of successful operation with?	Reliance on wet/dry or three-stream collection & processing processes and expanded waste composting not fully proven at Metro scale	Same as Alternative No. 1	Same as Alternative No. 1
What is the relative difference in estimated total costs for waste collection and waste management?	Lowest	Mid	High
What system components have specific operational needs?	Use of recovered material dependent on expanded markets. Highest use of landfill which is the most flexible approach	Same as Alternative related to Markets EFW sensitive to changes in waste Lower reliance on landfill affects system flexibility	Same as Alternative 2 Relative to EFW

7.08 Elements of the Preliminary Master Plan

The following is noted from the prior discussion:

- the quantity and composition of waste generated in Metro provides the opportunity to use any of the solid waste management components that pass the screening exercise;
- all waste management systems require landfill to manage some waste; in the considered alternatives, landfills would be required to handle from 18-42% of waste generated in the year 2000;
- enhanced recycling through programs such as Metro's 37 initiatives (Appendix "B") and other approaches such as "wet/dry" and "three-stream" collection/materials recovery will be required to achieve the diversion levels established by Metro and the province;
- waste segregation at source allows for flexibility in the system and the opportunity for new approaches;
- up to 50% of the waste generated can be incinerated;
- systems with greater diversity of components require more detailed waste composition information for reliable planning and implementation;
- all phases - reduction/reuse, collection, recycling, composting and disposal - are interdependent.

On this basis, an appropriate waste management system for Metro should include the following programs and facilities:

- an aggressive program of waste reduction and reuse with appropriate public education and regulatory components;

- a collection system that maximizes segregation at source, with maximum flexibility and efficiency;

- a comprehensive market development program to support recycling and composting;

- energy-from-waste programs to manage certain wastes such as wood and tires for a certain period until higher priority approaches can take over;

- one or more landfills that are eventually used only for the disposal of inert residuals;

- up to four dry waste sorting facilities to achieve maximum recycling efforts;

- up to four composting facilities sized to manage as much of the organic waste fraction as can be segregated;

- if EFW is selected as a preferred system component, then one or more such facilities with pre-processing to maximize recycling and materials recovery while also producing suitable feed;

- research and development programs to investigate and test new waste management techniques and approaches. This should include an expansion of Metro's current activities that test the feasibility of approaches using pilot programs and prototype facilities;

- an ongoing, comprehensive public participation program as part of program and facility implementation.

The three alternative systems described above each require a different schedule of facility construction and commissioning. These schedules are presented in Appendix "H" and are summarized as follows:

SCHEDULE FOR DEVELOPMENT OF FACILITIES

Approach		**Alternative No. 1***	**Alternative No. 2****	**Alternative No. 3 *****
Recycling Facilities	- 1st	1992	1992	1991
	- 2nd	1994	1994	1992
	- 3rd	1995	1995	1998
	- 4th	1995	1995	-
Composting Facilities	- 1st	1992	1992	1992
	- 2nd	1993	1993	1994
	- 3rd	1994	1994	1998
	- 4th	1995	1995	-
Energy-From-Waste Facilities	- 1st	-	1996	1996
	- 2nd	-	1998	1997
	- 3rd	-	1999	1998
	- 4th	-	-	1999

* Alternative System No. 1 - high diversion without EFW
** Alternative System No. 2 - high diversion with moderate EFW
*** Alternative System No. 3 - moderate diversion with high EFW

It is important to note that, no matter which alternative system or variation on a system is ultimately selected by Metro, the actual implementation schedule will be determined on an ongoing basis as new information on waste quantities and quality is obtained and as program and facility success is determined.

8.0 THE NEXT STEPS

8.01 Introduction

Preliminary estimates indicate that 71 million tonnes of solid waste will be generated in Metro over the next 20 years that will require management. The work to date has indicated there are some proven, some pilot and some experimental approaches that Metro should consider in the development of its waste management system. Recognizing the complexity and scheduling of the environmental assessment planning and approvals process, Metro must do all it can to initiate and establish programs and facilities that might assist in dealing with the long-term management of solid waste.

Metro policies present the development of a landfill-dependent or a landfill-dominated waste management system. The siting and establishment of landfill capacity and energy-from-waste incineration facilities will be extremely difficult. However, siting processes could be assisted by a demonstrated commitment by Metro to assume a leadership role among Ontario municipalities in research and development matters.

A necessary part of addressing the waste management problem is to fully satisfy the requirements of the EAA. This requires that the proponent fully document the planning process including the rationale for all decisions. The necessary studies must be undertaken. Metro's SWEAP process has recognized these commitments and a comprehensive program of study and documentation has been outlined.

The next steps in the SWEAP process require significant commitments from Metro. The following should be considered and initiated in the SWEAP planning and implementation process:

- The Public Participation Program, including public education, should continue with and be expanded where necessary;

- The SWEAP Technical Group should continue to co-ordinate all activities directed to establishing waste management programs and facilities. The scope of matters considered by this group should ensure that the long-term waste management system is developed in an orderly and rational manner;

- Metro Council should consider, modify if necessary, and approve the Solid Waste Management Policies. A draft of these policies was provided by the Commissioner of Works to Works Committee in January 1989. Those policies are extremely important to developing a master plan and would represent Metro Council's interim statement on waste management;

- The site search process for the proposed new 190 TPD prototype compost facility and for additional compost facilities should be continued. It is essential that Metro begin to establish these types of facilities as part of its system development process;

- The waste composition study should be continued. Available, secondary data has been adequate only to develop general estimates of program outcomes and to assist in the planning of systems including the identification of the possible range of program and facility sizes. Further information on the composition of solid waste generated is necessary;

- A site selection approach, including evaluation criteria to find preferred locations for an EFW facilities, should be finalized for review by the public and Metro Council. Following this, the EFW facility site search should be completed. This work should be in full progress by mid-1990;

- A prototype materials recovery facility should be established and a site search begun to identify locations for future materials recovery facilities;

- The role (e.g., number, size, type) of landfill in Metro's long-term system should be fully examined. This is an important part of the landfill site selection and system development process;

- Metro's long-term landfill site search process should continue and one or more landfills established;

- The pilot wet collection program should continue.

8.02 Public Input Requirements

The public participation efforts under the SWEAP program will be intensified as the thinking behind and the elements of the alternative systems are made public. These programs were delineated in Section 3.

These programs must be encouraged, co-ordinated and monitored and involve as many sectors of the community as possible if the necessary input is to be gained for the planning, development, approval and operation of the system.

8.03 Identifying Specific System Components

This Discussion Paper presents three alternative systems but does not make recommendations as to a preferred alternative. After public consultation and further Metro and agency review, a preferred system can be identified. At that time, the components of the preferred system must be described in greater detail.

Options will exist even within a preferred system and decisions will have to be made on the appropriateness of each component. Trade-offs will have to be made among components and the implications of component selection on the basis of environmental suitability, policy preference, public support and other factors will have to be addressed.

Facilities will have to be sized and sited. Once this has been determined, questions as to haul distances, collection techniques and programs, facility interaction, transfer stations and financial implications will require detailed analysis. This will lead to detailed study of site specific environmental impacts and measures to mitigate negative impacts.

System components should be based upon a firm commitment to reduction, reuse and recycling programs. If these programs are not an integral part of the overall system, the impetus for the 3Rs might well evaporate once new waste processing and disposal facilities are established.

8.04 Transition Plan

Implementation of a preferred system will occur over a period of years. A transition plan is required to direct and schedule modification of the current waste management system towards the ultimate long-term plan. This is particularly important because interim measures for waste management are being considered to increase waste disposal capacity and to increase the proportion of the waste stream that is reduced, reused and recycled. As part of the transition plan, the most effective roles for existing facilities should be determined.

The transition plan for implementing a preferred system might be as follows:

1989/90
- landfill site selection for an interim site to handle waste until a new waste management system is in place
- public participation in selection of preferred alternative system and components
- further technical studies into waste stream composition
- design of prototype wet/dry collection system and prototype dry sorting plant
- educational and planning measures to institute a pilot residential source separation program
- construction of 190 tonne/day prototype composting facility

1990/91
- identification of specific system components, capabilities and preferred sites
- environmental impact analysis of system components on a site specific basis
- economic, risk and financial analysis of the preferred system
- construction of prototype dry sorting plant

- expansion of composting plant

1991/92 - preparation of final master plan documents and submission to regulatory authorities for approval under relevant legislation
- upon regulatory approval, preparation of tender and other documents

1992/93 - construction of dry sorting, composting and, if part of the preferred system, energy-from-waste facilities

8.05 Master Plan Preparation

Preparation of the final Master Plan is dependent on a number of key conditions:

- jurisdictional matters relating to the municipalities that are or are not part of the Master Plan must be resolved;

- response by Metro officials and the public to issues raised in this document and specifically to the alternative systems identified must be forthcoming; and

- improved information especially relating to the composition of the waste stream, both residential and commercial/industrial, is necessary for proper facility identification, sizing and siting.

8.06 Interim Measures

Among the measures that should be undertaken in preparation for the transition to a new waste management system are:

- develop and implement public education programs;
- establish policies, including a compensation policy that address any adverse effects of facility siting and development;

- establish policies to guide provision of appropriate financial assistance to intervenors and others involved in the Master Plan process consistent with new Provincial legislation;
- co-ordinate, encourage and promote programs and initiatives to reduce, reuse and recycle waste generated in the study area;
- pursue the development of markets for products resulting from system facilities and programs (e.g., recycled materials, compost);
- encourage research and development;
- consider, on a case by case basis, involvement of the private sector in the new system.

Perhaps the most important interim measure to be undertaken is the establishment of new landfill capacity. Since existing landfill capacity is likely to run out in 1993, no matter which new waste management system is selected for implementation, landfill will play an important role. A landfill site search is presently underway.

APPENDIX A
List of SWEAP Discussion Papers

APPENDIX A

SWEAP DOCUMENT STREAMS

Each document may be produced in up to 3, ordered versions.
1) Discussion Documents are yellow first drafts of each paper.
2) Draft Working papers (green) are prepared for those documents requiring major revision.
3) Working Papers are the final, blue versions of each document.

1	**Reduction & Recycling** 1.1 Status Report on Solid Waste Reduction & Recycling 1.2 A Waste Reduction Strategy for Metro Toronto* 1.3 A Regulatory Agenda for Solid Waste Reduction 1.4 Metropolitan Toronto Reduction and Recycling Plan 1.5 Status Report on Solid Waste Reduction and Recycling, 1988[1]
2	**Landfill Site Search** 2.1 SWEAP Landfill and Study Area Characterization* 2.2 SWEAP Landfill Priority Area Identification [2] 2.3 SWEAP Landfill Candidate Site Identification 2.4 SWEAP Siting Opportunity Identification 2.5 SWEAP Candidate and Opportunity Site Screening 2.6 SWEAP Candidate Site Comparative Evaluation 2.7 SWEAP Assessment of Preferred Landfill Site(s)
3	**Technology Evaluation** 3.1 Introduction to Solid Waste Management Approaches 3.2 Long Term Planning Analysis of Solid Waste Mgt. Systems 3.3 Role of the Private Sector 3.4 Market Evaluation for Recyclable Materials 3.5 Site Selection for non-landfill Waste Mgt. Approaches[3] 3.6 Waste Composition Study[4]
4	**Data Collection** 4.1 Solid Waste Management System Inventory, Base Year, 1986 4.2 Solid Waste Management System Inventory, 1987 4.3 Solid Waste Management System Inventory, 1988[5]
5	**Public Participation** 5.1 Development of the Public Participation Program for SWEAP 5.2 Public Participation Program Phase 2: Establishment of the Core Program[6] 5.3 Public Participation Program Phase 3: Establishment of Outreach and Communications Programs[7]
6	**Public Education**
7	**Master Plan** 7.1 Towards A Solid Waste Master Plan: A Status Report On Metropolitan Toronto's Planning Process

NOTES . . .

[1] In preparation
[2] Draft under Works Department review
[3] In preparation
[4] In preparation
[5] In preparation
[6] In preparation
[7] December 1990

*These documents are green, draft working papers

DECEMBER 1989

APPENDIX B
Metro's Proposed Waste Reduction and Recycling Plan

METROPOLITAN WORKS DEPARTMENT

December 6, 1988

To: Metropolitan Works Committee

From: Commissioner of Works

Subject: Waste Reduction and Recycling Plan

Recommendations:

That we be authorized to implement, require, or request the following waste reduction and recycling measures in cooperation with our area municipalities, and invite the cooperation of the adjacent Regions served and the private sector, with a target of 30 per cent. reduction in tonnage by the year 1990, based on the 1987 rate of receipt of waste:

Disposal fees as incentive to reduce waste:

(1) increase the user fees charged to private haulers at Metropolitan Toronto landfill facilities from $50.00 to $85.00 per tonne, and from $65.00 to $100.00 at transfer stations, as of May 1, 1989;

(2) request the Province to amend the Metropolitan Toronto Act to allow a user fee to be charged to the six area municipalities and local boards, with a further report to be submitted describing the detailed basis of a user charge system that will provide the necessary incentive, and that the Regions of Durham and York be requested to adopt a user pay system to distribute their costs directly to their area municipalities.

Require/request action by Metropolitan Toronto, the area municipalities and Durham and York Regions by September 1989, except where otherwise noted, to:

(3) establish multi-material curbside collection of recyclables for apartments, and commercial areas serviced by municipal collections, with capital and operating cost contributions from Metropolitan Toronto on the same basis as for the single-family blue box program;

(4) reduce the number of collections of non-separated waste per week to encourage reduction and composting at source, and to minimize the additional cost of undertaking separate collections;

(5) immediately establish office paper recovery programs at all Metropolitan and municipal facilities and operations, including boards, agencies and commissions (e.g. Canadian National Exhibition, schools, etc.), as well as programs to recover any other recyclable material;

(6) include as many other materials as possible, such as mixed plastic bottles, in their recycling collection programs, when the market for these materials is confirmed;

(7) implement special spring and fall collections for organic yard wastes, including grass clippings, brush, trimmings, etc., and advertise the dates of these special collections to maximize recovery;

(8) establish a pilot program for wet/dry collection and processing for a total of 20,000 homes per year in Metropolitan Toronto;

(9) co-operate with Metropolitan Toronto to establish a 190 tonne per day composting plant to compost organic rich loads from residential, commercial and industrial sources subject to a further report on the preliminary design, siting and cost to be submitted by January 1989;

(10) investigate a requirement in the development review process to ensure all new buildings include recycling systems and a plan for the recovery of at least the materials separately collected in "blue box programs".

Ban the following materials from Metropolitan disposal sites, for which alternative recycling and/or disposal sites are, or when they are, available:

(11) all loads containing more than 50 per cent. by volume of recyclable corrugated cardboard by February 1, 1989;

(12) all leaves, except those which the municipalities will collect in bulk or in designated bags in separate loads only, for composting in Metropolitan Toronto, private, or their own compost sites; with the cost of leaf bags, advertising and composting being borne by Metropolitan Toronto, by September 1989;

(13) tires and wood wastes, (request for proposals from the private sector closes in January);

(14) large appliances ("white goods") immediately;

(15) demolition and construction wastes, excavated material and other non-putrescible waste that may be specified, as of June 1, 1989;

(16) waste drywall, (negotiations with a proponent are in progress);

(17) incinerated sewage sludge ash, as of June 1, 1989, (request for proposals for alternate site closed December 1, 1988);

(18) digested sewage sludge, by installation of additional sludge dewatering equipment at the Main Treatment Plant, and by installation of storage and unloading equipment at the Highland Creek Treatment Plant to permit use of available incineration capacity by June 1990;

(19) digested sewage sludge, by requesting proposals for land application at other than Metropolitan sites;

Requests to other levels of government for implementation by June 1989, except where otherwise noted:

(20) the Province of Ontario establish, expand and promote office paper recovery programs at all its offices within Metropolitan Toronto, as well as programs to recover any other recyclable materials;

(21) the Government of Canada establish, expand and promote office paper recovery programs at all its offices within Metropolitan Toronto, as well as programs to recover any other recyclable materials;

(22) the Provincial and Federal governments take immediate legislative and regulatory steps to reduce packaging, to require packaging which cannot be eliminated to be easily recyclable, and to reduce production of non-durable goods;

(23) the Provincial Ministries of the Environment, Energy and Transportation assist in the development of a market for waste tires by encouraging the use of powdered or crumbed rubber as a fuel supplement in cement kilns, in coal-fired energy production plants, and as an asphalt additive in paving materials;

(24) that Ontario Hydro consider the use of powdered or crumbed rubber as a fuel supplement at its coal-fired generating stations to assist in the development of a market for waste tires;

(25) that the Ministry of the Environment facilitate the diversion of selected recyclable wastes from Metropolitan Toronto to processing facilities located in other jurisdictions where capacity is available and does not exist in Metropolitan Toronto;

(26) that the Ministry of Education include in the 1989 school curricula for all elementary and secondary schools, information on the waste management situation, the options for solution, and their ramifications;

(27) that the Ministry of the Environment establish target dates to announce prohibition of disposal at landfill sites, throughout Ontario, of recyclable materials for which recycling technologies and markets are being developed, to be effective as soon as each facility or market is available, as a means of encouraging their development.

Involvement of Residents:

(28) request that in addition to participating in the blue box program, the residents of Metropolitan Toronto be requested to compost as much of their organic wastes as possible in their own backyard, and to change their buying and household habits and patterns to reduce, reuse and recycle;

(29) implement a public education program to inform the public, including industry and commerce, on the solid waste disposal problems, the options for solution, and their ramifications, at a gross estimated cost of approximately $2.5 million in 1989 and approximately $2 million over the period 1990-93;

Metropolitan Toronto Legislative Actions by June 1989:

(30) prepare a comprehensive solid waste management by-law governing the receipt of wastes at Metropolitan facilities and setting out the enforcement and penalties for violation;

(31) adopt a comprehensive procurement policy which gives preference to products and supplies that can be demonstrated, at least in part, to have been manufactured with materials derived from recycling programs and discuss a co-ordinated effort with the area municipalities, Regions of Durham and York, and the Provincial and Federal governments;

(32) develop and test a manifest system to control generation and disposal of certain types of waste and to assist with recycling and waste management planning; and

(33) apply for the necessary legislative amendments required to give effect to the foregoing recommendations.

Emergency Action:

(34) that categories of waste be established and a priority be assigned to each, to indicate the environmental and recycling impacts that would result from a ban of each category and that each category be banned progessively commencing January 1, 1990.

(35) ban disposal by private haulers at all Metropolitan facilities when the total approved remaining landfill capacity reaches five years for municipal solid waste, including waste for which Metropolitan Toronto must provide disposal under existing Agreements. This is estimated to occur in mid-1990;

(36) investigate restricting all development in Metropolitan Toronto, Durham and York Regions when the approved remaining capacity at Metropolitan landfill sites is reduced to five years for municipal solid waste and for waste which Metropolitan Toronto must accept under existing Agreements. This is estimated to occur in mid-1990;

(37) request that the Ontario Minister of the Environment order waste from Metropolitan Toronto to be disposed at other municipal/private landfills within an economic hauling distance of Metropolitan Toronto, when the remaining approved landfill capacity for municipal waste including waste for which Metropolitan Toronto must provide disposal under existing Agreements, is reduced to one year.

Background:

At the meeting of September 28 and 30, 1988, Metropolitan Council requested the Commissioner of Works to present a detailed emergency plan to a special meeting of the incoming Works Committee to be scheduled for mid-December 1988, and that the plan give consideration to the following:

(a) cut off landfill to the private sector;

(b) give special consideration to companies reducing their landfill requirements (use) by 50 per cent.

(c) increase tipping fees;

(d) report on diversion of waste to Keele Valley Landfill Site and report on tipping fees; and

(e) prepare up to date report on all aspects of the landfill search in order to provide a contingency plan within the next 12 months;

We have addressed the matter of the tipping fees and the ban on private sector waste in recommendations Nos. 1, 24 and 35.

The special consideration for companies filing evidence of recycling achievement would be difficult to monitor and verify. However, as a first step recommendation No. 32 would lead to a weigh bill system to monitor the movement of waste and further consideration will be given to how the private sector reduction can be achieved. The diversion of waste and the landfill search contingency plan are the subject of separate reports.

Metropolitan Toronto is running out of capacity for disposal of solid waste. At the present rate of filling, our two landfill sites will soon have to close: Brock West in Durham by August 1990 and Keele Valley in York in late 1992.

Due to our placing Brock South in abeyance temporarily, and the elimination of other proposed sites for a variety of reasons, it has now become too late to proceed through the approval process for a new landfill disposal site. Metropolitan Toronto is requesting the Province to assist in focusing and streamlining the process and to approve an interim landfill site while a new long-term solid waste management plan is being developed. The Province should further assist by joining in the site selection process at an early stage rather than give its position at the end of the process.

In the meantime, stricter regulations must be implemented to reduce the amount of solid waste brought for disposal at Metropolitan landfill sites, in order to deal with the short-term crisis situation.

We have outlined measures in this report to mitigate and delay the impending crisis. A separate report deals with recommendations to obtain approval of interim landfill capacity, which is the only measure which will eliminate the impending crisis we are facing.

The following discussion supports the recommended waste reduction measures which have as a target a 30 per cent. reduction in waste received at Metropolitan Toronto facilities by the end of 1990. The achievement of this goal should not be taken for granted and it may prove impossible. However, it is a valid target. The following supporting background information has been arranged in numerical order in accordance with the above recommendations:

Disposal fees as incentive to reduce waste:

(1) Refuse disposal fees at Metropolitan Toronto's landfill sites were increased May 1, 1988, from $18.07 to $50.00. The increased fee has already resulted in a decrease in the tonnage delivered to Metropolitan disposal facilities since that date, both through reduction in the amount of waste being generated and diversion of waste to private landfill sites which permit non-putrescible waste only.

The decision of Metropolitan Toronto to fund the net cost of the blue-box recycling program and provide operational support, implicitly set the rate at which it is prepared to allocate funds to conserve scarce landfill space. The cost of the blue-box recycling program at present is about $70.00 per tonne and the 1989 rate for landfill disposal should not be set lower than the cost of recycling. In addition, the Region of Halton is setting its 1989 fee at between $80.00 and $85.00 per tonne and it is expected that the Region of Peel will also set its fee at a similar level. In order to ensure that waste is not diverted to our facilities from these neighbouring regions because of a lower rate, it is proposed that the 1989 rate for landfill disposal be set at $85.00 per tonne. The disposal fee at Transfer Stations would be $100.00 per tonne, maintaining the previous differential between landfill and transfer fees.

The substantial increase in fees in 1988 and recommended for 1989 should serve as a significant deterrent to waste. More frequent increases would present administrative complication but should be considered after evaluation of the 1989 increase.

Waste received since the 1988 increase went into effect has decreased, with the result that 1988 will be approximately 1 per cent over 1987, whereas, prior to the fee increase (May 1, 1988) waste received was increasing at an annual rate of 8 per cent.

The Committee may wish to provide an opportunity for those affected by the proposed fee increase to appear as deputants in January, 1989, before finalizing the proposed adjustment. A number of protests were registered over the similar jump in rates in 1988.

(2) At present, the cost of refuse disposal for Metropolitan Toronto's six area municipalities is paid out of the Metropolitan tax levy, based on the assessment of each area municipality. Local boards do not pay. An amendment to the Metropolitan Toronto Act would be required if the Metropolitan Corporation is to change this method of funding. A request was filed with the province to allow for user fees to be paid by local boards within the Metropolitan area, and they have replied requesting that the area municipalities be included as well.

A change from assessment funding to user pay on 100 per cent. of the waste would cause hardship to those municipalities with the lowest assessments with the prospect of only up to 30 per cent. reduction in waste. The application of a user fee to that portion of the waste collected that could be diverted from disposal would provide the necessary incentive to encourage waste reduction action. It is proposed, therefore, that the user charge to our Area Municipalities be based on a 30 per cent. target for recycling and that municipal refuse in excess of 70 per cent. of each municipality's 1987 tonnage be subjected to a user charge. The rate to be applied should be the disposal fee less the rebate of the difference between annual cost per tonne and the fee and annual fee applied to the municipal tonnage. The contribution per tonne to landfill capacity reserve should also be deducted, because the Metropolitan area municipalities retain the obligation to pay their share of capital expenditures in future. The 30 per cent. target for recycling and application of user pay should be reviewed from time to time. The diversion credit would continue to apply to the amount of waste diverted.

A user pay system will clearly show the true cost of disposal at the local level and encourage the municipalities in their efforts to reduce, re-use and recycle.

Require/Request action by Metropolitan Toronto, the area municipalities and Durham and York Regions:

(3) Steps must be taken to expand recycling to apartments and commercial areas. One-third of Metropolitan Toronto's population lives in apartments and does not currently have the opportunity to participate in recycling newspapers, glass, metal, and PET containers. Metropolitan Council has approved in principle extension of the Metropolitan Toronto net operating cost funding program to the area municipalities implementing recycling in apartments. The area municipalities have been requested to report by January 1, 1989, on the costs and required funding for their programs. In order to ensure that these programs are implemented promptly, and serve all apartment dwellers, it is proposed that all the area municipalities be requested to establish separate multi-material collection programs in all apartments. This would result in an annual diversion of 25,000 tonnes.

This requirement should be expanded to include programs that recover recyclable materials generated by smaller commercial establishments served by municipal collection. These materials include corrugated cardboard from retail stores and glass containers from restaurants and taverns. A minimum annual diversion of 10,000 tonnes would result.

(4) Every effort must be made by all agencies, organizations and individuals to reduce the amount of waste. The addition of the several separate and special collections to the previous 3-times-per-week collections provide too much service, which could have the effect of encouraging waste. The "blue box" programs and wet/dry pilot programs are being added to three times per week collection of non-separated waste. As the number of separate collections increases, the amount of material for, and therefore the number of, non-separate collections should decrease. Collection of household waste has been provided twice a week, with some municipalities providing a third collection on Wednesdays for yard waste and bulky materials. With once a week collection, there would be more reason for the residents to use the blue-boxes for recycling and thereby reduce the quantity of waste requiring disposal. Municipal refuse waste costs should decrease significantly, with the cost of their blue-box and special collections still being covered by Metropolitan Toronto. The need for 2-times per week collection for putrescible waste was based on sanitation and odour control. However, the advent of plastic bags permits change. Most municipalities outside of Metropolitan Toronto provide collection only once a week.

(5) All municipal agencies, boards and commissions which produce significant quantities of waste that can be recycled should be required to do so. Some programs are in place, such as in-house office paper recovery in some Metropolitan and municipal offices, but much more can be done. It is proposed that all Municipal Agencies, Boards and Commissions, including the Canadian National Exhibition and School Boards, be requested to implement office paper recovery programs at all facilities as well as programs to recover any other recyclable material.

(6) Markets for other recyclable materials such as high-density polytheylene (H.D.P.E.) plastics are continuing to develop. It is proposed that the area municipalities be requested to include as many other materials as possible in their blue box collection programs as soon as markets for the materials are confirmed.

Market developments may permit H.D.P.E. to be added to the blue box program soon.

(7) While Metropolitan-wide composting of leaves will result in a significant reduction in the municipal waste stream, there is still additional yard waste that can be diverted from landfill, but must be handled separately. For example, three area municipalities operated Christmas tree recycling programs in 1987, in which the trees were collected separately on designated dates, chipped and used in municipal parks. In order to maximize material recovery, it is proposed that the area municipalities be requested to implement similar collection programs for all other yard waste, including lawn cuttings, weeds, tree and shrub prunings and garden waste. Materials could then be composted at Metropolitan, municipal or private sector sites.

(8,9) The wet/dry collection system is an enhanced waste recycling approach demonstrated in some European communities. In order to determine whether such a program can be successfully implemented in Metropolitan Toronto, Metropolitan Council has authorized this Department to proceed with a pilot collection and processing program in order to determine the applicability to the Metropolitan Toronto area. It is proposed that Metropolitan Toronto, in co-operation with the area municipalities, implement a pilot wet/dry collection program equivalent to 20,000 households as soon as possible, based on the existing composting capacity at the Dufferin Transfer Station and additional equipment to process the dry fraction. The next phase is the design of a 190 tonne per day wet/dry composting plant that will accommodate additional organic material from residential, industrial and commercial sources equivalent to the wet waste which would be produced by another approximately 100,000 homes. The net additional collection cost will be paid by Metropolitan Toronto.

(11) A large quantity of corrugated cardboard is currently being recovered from Metropolitan Toronto's waste stream, however, the potential exists to increase this quantity substantially. To date, Metropolitan Toronto's efforts to increase recycling of corrugated cardboard have depended on voluntary participation by the private sector. There are still many firms who fail to source separate this recyclable material. In order to increase the diversion of this material, mandatory programs are now proposed. It is recommended that loads containing more than 50 per cent. by volume of corrugated cardboard be prohibited from Metropolitan disposal facilities, using a phased approach. It is proposed that single source loads be prohibited effective February 1, 1989, with a one month grace period allowed before applying the prohibition to multiple source loads. The appropriate guidelines and enforcement criteria of this ban are the subject of a separate report.

(12) In 1987, most of the area municipalities composted leaves from selected collection areas, resulting in a diversion of 5,000 tonnes. It is estimated that composting all the leaves collected could divert approximately 60,000 tonnes annually. In the past the problem has been availability of suitable space, however, Metropolitan Toronto has now provided a site to compost all the leaves collected in 1988, primarily as part of street cleaning operations. This site is currently the largest leaf composting operation in North America.

It is now proposed that the area municipalities be required to include all leaves put out by residents in their separate composting collections. The leaves should be collected in bulk, or in specially designated biodegradable bags, and composted at Metropolitan, municipal, or private sector sites. It is proposed that the cost of composting, promotion and provision of biodegradable bags, estimated to be approximately $3 million annually, be borne by Metropolitan Toronto.

(13) Up to 20,000 tonnes of tires and between 50,000 and 100,000 tonnes of wood could potentially be diverted from landfill every year. A request for proposals from the private sector has been issued and closes in January 1989. It is proposed that following selection of the successful proponent and commencement of operation of alternate recycling and/or disposal sites, tires and wood be prohibited from Metropolitan disposal sites.

(14) Most of the area municipalities are currently operating special collection programs to recover appliances "white goods" (e.g. refrigerators, stoves, etc.) for recycling, and the Metropolitan recycling diversion credit of $16.00 per tonne is paid to the municipalities to divert this material from Metropolitan landfill sites. Nevertheless, "white goods" are still being delivered to Metro for disposal -- estimated to be equal to double the amount being recycled. It is proposed, therefore, to prohibit all white goods at Metropolitan sites to ensure maximum diversion.

(15) The quantity of demolition and construction debris received at Metropolitan disposal facilities in 1987 was estimated to be over 400,000 tonnes. Another 100,000 tonnes was processed through a private transfer station and delivered to a private landfill site in Dundas, Ontario.

A number of such "inert" waste sites are located relatively close to the Metropolitan area and it is therefore proposed to prohibit these materials from Metropolitan landfill sites as of June 1, 1989.

(16) Waste drywall can be recycled and discussions are already underway with gypsum recycling industries to establish a plant in the greater Metropolitan area. It is proposed that waste drywall be prohibited from all Metropolitan disposal facilities when negotiations with the private sector result in an alternative recycling and/or disposal site. About 30,000 tonnes annually can be diverted.

(17,18,19) Approximately 100,000 tonnes per year of digested sewage sludge from the Metropolitan Humber Sewage Treatment Plant in Etobicoke are currently disposed at the Brock West Landfill Site in the Region of Durham.

It is essential that the digested sewage sludge continues to be accommodated at Brock West, which is permitted under the existing Provincial Certificate of Approval for this site. The Keele Valley landfill is not allowed to accept this material.

Installation of additional sludge dewatering equipment at the Main Treatment Plant and installation of storage and unloading equipment at the Highland Creek Treatment Plant is proposed to permit use of available incineration capacity.

It is also proposed that the possibility of diverting sewage sludge from landfill be investigated by means of a Request for Proposals for land application or other use of digested sewage sludge.

Proposals have been requested for the recycling and/or disposal of sewage sludge ash at other than Metropolitan Toronto sites. It is proposed that after selection of the successful proponent and establishment of an alternate recycling and/or disposal site, diversion of sewage sludge ash commence effective June 1, 1989. One proposal involving vermiculture, which was the subject of a recent report to your Committee, is anticipated.

Requests to other levels of government:

(20,21) Since the Provincial and Federal governments generate waste in Metropolitan Toronto, they should be requested to implement office paper recycling programs immediately.

(22) Since packaging accounts for half the volume of solid waste generated, major efforts should be undertaken, beginning immediately, to legislate measures which will reduce the volume, and facilitate the recycling of packaging. Since regulations which apply across the country are needed, federal action would be the most effective, however, certain provincial legislation is also required.

(27) Metropolitan Toronto as well as the Regions of Peel, Halton and Durham have made a commitment to prohibit receipt of drywall at their sites subject to the establishment of a private sector site to recycle the material. However, private landfill owners have not agreed to prohibit this material, which creates a significant barrier to the establishment of a drywall recycling plant in the Metropolitan Toronto area. The private sector is reluctant to take the risk of competing against landfills that could potentially offer lower disposal rates for drywall and attract all of the material banned from municipal sites. In order to facilitate recycling initiatives, such as the establishment of a drywall recycling plant, it is recommended that the Province of Ontario be requested to prohibit the disposal at private landfill of any material for which recycling technologies and markets are being developed, e.g., drywall.

Involvement of Residents:

(28) Residents of Metropolitan Toronto and the Region of York and Durham should be strongly encouraged to undertake backyard composting of food and yard wastes, (excluding meat, bones and fatty foods) to the greatest extent practical.

(29) This Department is currently developing a public education program to inform the public on the solid waste disposal problem, the options for solution and the ramifications thereof. Our preliminary program involves paid radio, television and newspaper advertisements as well as videos, information kits, transit cards posters, buttons etc., at a gross estimated cost of $2.5 million in 1989 and a further $2 million over the period 1990-1993. The program will also include the development of curricula packages for use in both elementary and secondary schools.

Metropolitan Toronto Legislative Actions:

(30) At present, operations at Metropolitan waste management facilities are governed by regulations posted at each site and enforced by Violation Notice. In order to enforce existing regulations and the proposed prohibitions on specific wastes properly, development of a comprehensive solid waste management bylaw is recommended.

The proposed bylaw would require specific standards be established, for both the public and private sector waste, and would include the appropriate penalties for violations. The bylaw may prohibit the delivery of certain types of wastes to Metropolitan Toronto's faciliies; however, alternative processing centres should be made available for the re-use and/or disposal of such wastes.

(31) In order for recycling to succeed over the long-term, sufficient markets for the recovered materials must exist. Comprehensive procurement policies stimulate and increase demand for recovered waste materials. Metropolitan Toronto currently has a positive procurement policy for re-refined oil and fine paper.

Similar policies are required for other materials, which give preference to products and supplies that can be demonstrated, at least in part, to have been manufactured with materials derived from recycling programs.

These policies should be common to all municipalities in Ontario and therefore the Province should adopt such policies to support the markets for recycled material.

(32) In 1977, the Ministry of the Environment introduced a manifest, or waybill, system for monitoring the generation, transport and disposal of hazardous wastes, and the regulation is providing important information on hazardous waste generators, carriers, and receivers. A manifest system for solid waste is recommended to be developed and tested by Metropolitan Toronto to track municipal, commercial, and non-hazardous solid wastes being delivered to Metropolitan Toronto's disposal facilities. Such a system would provide greater powers to track loads containing significant amounts of recyclable materials and to require generators to take appropriate action to reduce their waste. It would allow greater control of the waste management system in Metropolitan Toronto and improve existing data on waste composition and waste generation.

The weigh bill system would provide a verifiable basis for monitoring this reduction of waste from the private sector and for application of incentives or penalties including banning when efforts to reduce are unsatisfactory.

Contingency Action:

(33) Since 1967, a primary responsibility of the Metropolitan Toronto Corporation has been to provide disposal services for its area municipalities. It is therefore proposed to put the private sector on notice that if Metropolitan Toronto cannot secure additional disposal capacity by the time that five year capacity remains for municipal solid waste and for waste which Metropolitan Toronto must provide disposal under existing Agreement, then Metropolitan disposal facilities will no longer be available for private waste disposal.

Metropolitan Toronto is party to separate Agreements with the Regions of Durham and York with conditions pertaining to the receipt at Metropolitan Landfills of wastes generated within those Regions. Therefore, the Regions of Durham and York should be consulted regarding a similar ban on private sector waste generated therein.

At the present rates of generation and based on the above criteria, the ban on private sector wastes would occur in mid 1990.

(36) Earlier this year, the Region of Peel imposed a freeze on all development activity within the Region until adequate waste management capacity was restored. The step was taken when the Ministry of the Environment rejected the Environmental Assessment submission on the Region's proposed new landfill in Brampton.

It is recommended that consideration be given to a similar development freeze for Metropolitan Toronto, when remaining approved landfill capacity is reduced to 5 years for municipal solid waste and for that waste covered by Metropolitan Toronto's existing Agreements. It is also recommended that the Regions of Durham and York, which generate approximately 25 per cent. of the waste handled at Metropolitan landfills, be requested to enact similar development controls within their jurisdiction.

Population in Metropolitan Toronto, Durham and York is expected to increase by approximately 350,000 during the interim period (1997). Assuming an average total waste generation rate of approximately one tonne per capita per year, appropriate development control could restrict future growth in waste generation by approximately 350,000 tonnes.

This recommendation would have significant negative impact, and should be implemented only after positive initiatives have failed to bring required results.

(37) The Ministry of the Environment recently ordered Metropolitan Toronto to accept solid waste from the Town of Orangeville and from the North Simcoe Solid Waste Management Association. In view of the crisis in Metropolitan Toronto, the remaining capacity of existing municipal and private landfills outside Metropolitan Toronto should be reviewed. It is proposed that when remaining approved landfill capacity is reduced to one year for municipal solid wastes and for waste covered by Metropolitan Toronto's existing Agreements and where sufficient capacity exists, the Province should facilitate co-operation with those jurisdictions to accept a portion of waste from Metropolitan Toronto. Equivalent replacement capacity could be provided at future Metropolitan landfills.

Summary

For the purposes of this report the recent decision of Durham to withdraw from the joint site search with Metropolitan Toronto and from S.W.E.A.P., has been assumed not to effect their desire to join with Metropolitan Toronto in adopting all possible waste reduction initiatives as long as they continue to share use of the Brock West Landfill Site with Metropolitan toronto.

An Interim Landfill Capacity and Site Contingency Plan is the subject of a separate report. It describes the status of the interim site search and recommends the course of action. This Waste Reduction Plan and recycling and the Interim Landfill Site Contingency Plan describe the action that is recommended under the circumstances existing at this time.

In estimating the annual quantity reduction of each feasible interim initiative, optimistic estimates of the quantities of possible solid waste diversion were employed. In estimating the quantity reduction for each initiative, an effort was made to avoid double counting of reductions, therefore reductions identified for specific initiatives may not be as large as might be expected to occur through implementation of that specific initiative in isolation from the others. However, since many of these initiatives are interrelated, particularly, the raising of tipping fees, and the implementation of a user pay system for Metropolitan Toronto Area Municipalities, their cumulative effect will only be ascertainable through implementation and examination of results. At the present time funding for many of these initiatives is being carried in the 1989 Capital Works Program, although it is anticipated that the funds will be available through capital from current or through the Waste Reserve Fund.

We have not referred to Contingency Plan in this report because with the exception of banning disposal by private haulers and restriction of development, most of the initiatives represent good waste management for the future. This report should be read in conjunction with the Interim Landfill Capacity and Site Contingency Plan which together constitute a Contingency Plan.

RG Ferguson

R.G. Ferguson - Deputy Commissioner

WGC/RGF/ww

Metropolitan Toronto Department of Works
TABLE 1
Estimated Annual Reduction/Diversion In Waste Received At Metropolitan Toronto Facilities

Program		Estimated Material Diverted (Tonnes)	
		1989	1990
(1)	Disposal Fee Increase	90,000	135,000
(2)	Municipal User Fee	25,000	50,000
(3)	Apartments and Light Commercial	15,000	35,000
(4)	Once Per Week Collection	10,000	50,000
(5)	Agencies, Boards and Commissions	5,000	10,000
(6)	Expansion of Blue-Box Materials	5,000	15,000
(7)	Brush Collection	40,000	40,000
(8)	Pilot Wet/Dry Collection	3,000	20,000
(9)	Organic Waste from Industry	-	50,000
(12)	Corrugated Cardboard	50,000	75,000
(13)	Leaves	60,000	60,000
(14)	Tires and Wood Waste	16,000	63,000
(15)	Large Appliances	5,000	5,000
(16)	Demolition and Construction Waste	60,000	100,000
(17)	Drywall	5,000	30,000
(18-19-20)	Sewage Sludge And Ash	60,000	120,000
(22-23)	Provincial and Federal Office Paper	1,000	2,000
(33)	Backyard Composting	5,000	10,000
	Existing Blue-Box Collection in Metropolitan Toronto	60,000	60,000
	Existing Municipal Recovery Programs in York and Durham	45,000	60,000
	TOTAL	560,000	990,000
	Percent of Total Solid Waste	17%	30%

(34-35) Ban on disposal by private haulers of 900,000 tonnes per year will result in a further reduction of (27%) commencing mid-1990.

Projections are based on preliminary estimates and include waste diversion through reduction and recycling initiatives identified in the Report. Not all initiatives can be quantified at this time (e.g. packaging legislation) or apply to waste reduction and recycling (e.g. outright ban on private sector refuse), and therefore quantities are not reflected in the Table. Program numbers in this Table correspond to recommendations in Report.

The Municipality of
Metropolitan Toronto

Metropolitan Clerk's Department
City Hall, Toronto, Ontario, Canada M5H 2N1
Telex: 06-23472 Fax: (416) 392-2980
Telephone: 392-8027

Daniel Crombie, *Metropolitan Toronto Clerk*
Novina Wong, *Deputy Metropolitan Clerk*

December 16, 1988.

DEPUTY COMMISSIONER OF WORKS:

The Works Committee on December 16, 1988, had before it the attached report (December 6, 1988) from the Deputy Commissioner of Works submitting a waste reduction and recycling plan; and recommending that authorization be granted to implement, require, or request waste reduction and recycling measures, as outlined, in co-operation with the Area Municipalities, and invite the co-operation of the adjacent Regions served and the private sector, with a target of 30 per cent. reduction in tonnage by the year 1990, based on the 1987 rate of receipt of waste.

The following persons appeared before the Committee and submitted briefs in connection with the foregoing matter:

Councillor Tony O'Donohue, City of Toronto,
and President, Environmental Probe Limited;

Ms. Nancy Cluff and Mr. Robert J. Redhead,
Ontario Waste Management Association;

Mr. Paul Lisanti, representing Dual Removal Systems
and S.W.E.A.P. Waste Managers/Industry Advisory Caucus;

Mr. Thomas Rahn, representing S.W.E.A.P.
Environmental Organizations Caucus;

Mr. Bruce Pope, respresenting S.W.E.A.P.
Multistakeholders' Committee;

Mr. Kenneth L. Wulff, S.W.E.A.P.;

Mr. Peter Tabuns, Citizens for a Safe Environment; and

Mr. Ted Mallett, Canadian Federation of Independent Business.

(Cont'd)

The Committee:

A. recommended to Council the adoption of the following recommendations embodied in the aforementioned report of the Deputy Commissioner of Works, amended as follows:

Disposal Fees as Incentive to reduce waste:

(2) request the Province to amend the Metropolitan Toronto Act to allow a user fee to be charged to the six area municipalities and local boards, with a further report to be submitted describing the detailed basis of a user charge system that will provide the necessary incentive, and that the Regions of Durham and York be requested to adopt a user pay system to distribute their costs directly to their area municipalities.

Require/request action by Metropolitan Toronto, the area municipalities and Durham and York Regions by September 1989, except where otherwise noted, to:

(3) establish multi-material collection of recyclables for apartments, and commercial areas serviced by municipal collections, with capital and operating cost contributions from Metropolitan Toronto on the same basis as for the single-family blue box program;

(6) include as many other materials as possible, such as mixed plastic bottles and corrugated cardboard, in their recycling collection programs, when the market for these materials is confirmed;

(8) establish a pilot program for wet/dry collection and processing for a total of 20,000 homes per year in Metropolitan Toronto;

(9) co-operate with Metropolitan Toronto to establish a 190 tonne per day composting plant to compost organic rich loads from residential, commercial and industrial sources subject to a further report on the preliminary design, siting and cost to be submitted by January, 1989;

(10) investigate a requirement in the building permit process to ensure all new buildings include recycling systems and a plan for the recovery of at least the materials separately collected in "blue box programs".

Ban the following materials from Metropolitan disposal sites, for which alternative recycling and/or disposal sites are, or when they are, available:

(Cont'd)

(11) all loads containing more than 50 per cent. by volume of recyclable corrugated cardboard by February 1, 1989, and more than 20 percent. by September 1, 1989;

(12) all leaves, except those which the municipalities will collect in bulk or in designated bags in separate loads only, for composting in Metropolitan Toronto, private, or their own compost sites; with the cost of leaf bags, advertising and composting being borne by Metropolitan Toronto, by September, 1989;

(13) tires and wood wastes (request for proposals from the private sector closes in January);

(14) large appliances ("white goods") immediately;

(15) demolition and construction wastes, excavated material and other non-putrescible waste that may be specified, as of June 1, 1989;

(16) waste drywall (negotiations with a proponent are in progress);

(17) incinerated sewage sludge ash, as of June 1, 1989 (request for proposals for alternate site closed December 1, 1988);

(18) digested sewage sludge, by installation of additional sludge dewatering equipment at the Main Treatment Plant, and by installation of storage and unloading equipment at the Highland Creek Treatment Plant to permit use of available incineration capacity by June, 1990;

(19) digested sewage sludge, by requesting proposals for land application at other than Metropolitan sites.

Requests to other levels of government for implementation by June, 1989, except where otherwise noted:

(20) the Province of Ontario establish, expand and promote office paper recovery programs at all its offices within Metropolitan Toronto, as well as programs to recover any other recyclable materials;

(21) the Government of Canada establish, expand and promote office paper recovery programs at all its offices within Metropolitan Toronto, as well as programs to recover any other recycable materials;

(22) the Provincial and Federal governments take immediate legislative and regulatory steps to reduce packaging, to require packaging which

(Cont'd)

cannot be eliminated to be easily recyclable, and to reduce production of non-durable goods;

(23) the Provincial Ministries of the Environment, Energy and Transportation assist in the development of a market for waste tires by encouraging the use of powdered or crumbed rbber as a fuel supplement in cement kilns, in coal-fired energy production plants, and as an asphalt additive in paving materials;

(24) Ontario Hydro consider the use of powdered or crumbed rubber as a fuel supplement at its coal-fired generating stations to assist in the development of a market for waste tires;

(25) the Ministry of the Environment facilitate the diversion of selected recyclable wastes from Metropolitan Toronto to processing facilities located in other jurisdictions where capacity is available and does not exist in Metropolitan Toronto;

(26) the Ministry of Education include in the 1989 school curricula for all elementary and secondary schools, information on the waste management situation, the options for solution, and their ramifications;

(27) the Ministry of the Environment establish target dates to announce prohibition of disposal at landfill sites, throughout Ontario, of recyclable materials for which recycling technologies and markets are being developed, to be effective as soon as each facility or market is available, as a means of encouraging their development.

Metropolitan Toronto Legislative Actions by June, 1989:

(30) prepare a comprehensive solid waste management by-law governing the receipt of wastes at Metropolitan facilities and setting out the enforcement and penalties for violation;

(31) adopt a comprehensive procurement policy which gives preference to products and supplies that can be demonstrated at least in part, to have been manufactured with materials derived from recycling programs and discuss a co-ordinated effort with the area municipalities, Regions of Durham and York, and the Provincial and Federal governments;

(32) develop and test a manifest system to control generation and disposal of certain types of waste and to assist with recycling and waste management planning;

(Cont'd)

(33) apply for the necessary legislative amendments required to give effect to the foregoing recommendations.

Emergency Action:

(34) that categories of waste be established and a priority be assigned to each, to indicate the environmental and recycling impacts that would result from a ban of each category and that each category be banned progessively commencing January 1, 1990;

B. further recommended to Council the adoption of the following new recommendations:

"(10a) encourage collection of household hazardous and toxic waste on a regular basis; and

(27a) the Province of Ontario be requested to petition the Liquor Control Board of Ontario to implement returnable bottles and point of purchase incentives to encourage such bottle return.

The Committee further:

(i) deferred Recommendation No. (1), together with the following motion by Councillor Gilbert:

> "That Recommendation No. (1) be amended by deleting the date 'May 1, 1989', and substituting therefor the date 'March 1, 1989'.",

for consideration at the next meeting of the Works Committee on January 11, 1989, with a request that:

(a) the Deputy Commissioner of Works be requested to begin immediate negotiations with the Ontario Waste Management Association with respect to Letter of Credit arrangements necessary for private haulers to accommodate the proposed increase;

(b) the Deputy Commissioner of Works be requested to report to the Works Committee on how Metropolitan Toronto can assist the private haulers with their recycling programs; and

(c) the private hauler sector be invited to appear before the Works Committee on January 11, 1989, to discuss the proposed user fees and Letter of Credit arrangements;

(Cont'd)

(ii) referred the following recommendations to the Area Municipalities, with a request that they submit comments thereon to the works Committee within two months:

"(4) reduce the number of collections of non-separated waste per week to encourage reduction and composting at source, and to minimize the additional cost of undertaking separate collections;

(5) immediately establish office paper recovery programs at all Metropolitan and municipal facilities and operations, including boards, agencies and commissions (e.g. Canadian National Exhibition, schools, etc.), as well as programs to recover any other recylable material; and

(7) implement special spring and fall collections for organic yard wastes, including grass clippings, brush, trimmings, etc., and advertise the dates of these special collections to maximize recovery;";

and that the Deputy Commissioner of Works be requested to meet as soon as possible with the Commissioners of Works of the Area Municipalities with a view to resolving any concerns raised with regard to Recommendations Nos. (3) to (10a), and report thereon to the Works Committee;

(iii) directed that the Commissioner of Planning be requested to submit a a report to the Works Committee as soon as possible on the necessary regulations required to implement Recommendation No. 10, including in such report comments from the Area Municipalities;

(iv) directed that, with respect to Recommendation No. (10a), the Deputy Commissioner of Works be requested to report to the Works Committee on the banning of household hazardous and toxic waste from landfill sites;

(v) directed that, with respect to Recommendation No. (12), the Deputy Commissioner of Works be requested to report to the Works Committee in February, 1989, on the type of bags to be designated and the location of sites for composting;

(vi) directed that, with respect to Recommendations Nos. (18) and (19), the Deputy Commissioner of Works be requested to report to the Works Committee on February 22, 1989, on the progress to find alternatives to incineration of sewage sludge, and on the operation and emissions from incineration;

(Cont'd)

(vii) directed that, with respect to Recommendation No. (23), the Deputy Commissioner of Works, in conjunction with private haulers, be requested to investigate alternative uses for tire waste, and report thereon to the Works Committee;

(viii) referred the following Recommendations Nos. (28) and (29) to the Deputy Commissioner of Works with a request that he adopt a more ambitious approach, and report thereon to the Works Committee on January 11, 1989:

"Involvement of Residents:

(28) that, in addition to participating in the blue box program, the residents of Metropolitan Toronto be requested to compost as much of their organic wastes as possible in their own backyard, and to change their buying and household habits and patterns to reduce, reuse and recycle;

(29) implement a public education program to inform the public, including industry and commerce, on the solid waste disposal problems, the options for solution, and their ramifications, at a gross estimated cost of approximately $2.5 million in 1989 and approximately $2 million over the period 1990-93.";

(ix) directed that, with respect to Recommendations Nos. (30) to (33), the Deputy Commissioner of Works be requested to submit reports thereon to the Works Committee by March, 1989;

(x) directed that, with respect to Recommendation No. (34), the Deputy Commissioner of Works be requested to report to the Works Committee in March, 1989, on the categories of waste from the private sector, and details of the progressive implementation of banning such waste; and

(xi) deferred Recommendations Nos. (35) to (37) for consideration at the meeting of the Works Committee to be held on January 25, 1989, with a request that:

(a) Mr. Gardner Church of the Provincial Ministry of the Environment, and appropriate Provincial officials be invited to attend such meeting; and

(Cont'd)

(b) a private meeting be arranged between the Works Committee and Mr. Gardner Church to discuss Recommendations Nos. (35) to (37) prior to the meeting of the Works Committee on January 11, 1989.

Metropolitan Toronto Clerk.

R. Dyers/ls
Enclosure.

Sent to: Deputy Commissioner of Works
Clerks of the Area Municipalities
Mr. Gardner Church, Ministry of the Environment
Commissioner of Planning
All Interested Parties

APPENDIX C

Waste Management Components and Opportunities

Appendix C

WASTE MANAGEMENT COMPONENTS AND OPPORTUNITIES

C.01 Introduction

This section presents an overview of the various techniques and methods for managing solid waste. These alternatives may each be applicable to some or the entire portion of the waste stream and may be combined to form a complete waste management system. Further details are available in Discussion Papers 3.1 and 3.2.

Waste Management alternatives may be grouped into the following categories:

Before Collection:
- waste reduction, including backyard composting
- waste reuse

After Collection:
- recycling by source separation
- materials recovery
- composting
- incineration with or without energy recovery
- production of refuse-derived-fuel (RDF)
- landfilling
- export of waste

C.02 Collection Alternatives

Collection alternatives are important to note at this stage as they may have an impact on the types and diversion rates of the disposal alternatives. The basic collection method is the one practiced now in parts of Metro: Blue Box plus regular garbage collection, with separate collection of newspaper. In this case only the Blue Box materials and newspaper are recycled at materials processing facilities. The potential for recovering materials from the mixed waste fraction is severely limited because of contamination.

Appendix C

Two alternative collection approaches are known as "three stream" and "wet/dry" and are described below.

The Three-Stream Approach:

The three-stream approach involves collection and processing of residential waste in three fractions: recyclables, specified compostable organic material and mixed waste. The materials included for recycling and composting are specified by the municipality and all non-specified material is then collected in the third stream. Households would need three containers: a recyclables container (probably larger than the present Blue Boxes); a sealable container for the wet kitchen waste and other specified compostables; and regular waste containers for the mixed waste.

Under the three-stream approach, recyclables would include specifiable materials with identified markets that householders could practically separate:

- all paper and cardboard except tissues, paper and cardboard with coatings, adhesives or food contamination
- all glass bottles and jars but no flat glass, lightbulbs, ceramics, glass ornaments, etc.
- all metal cans
- all plastic containers except those heavily contaminated by greases or oils, plastic laminated to other materials and foam plastics.

Specified compostables would include:

- all food waste
- all organic yard waste except large tree trimmings

The third stream would contain all materials not placed in the recyclable or compostable containers, including unseparated waste from non-participating households and waste for which the householder is unsure about proper disposal.

The recyclable materials would go to a processing centre. More residue would be generated with this method than from a Blue Box approach because of the increased variety of materials placed in the containers. Processing experience is limited at this time.

The separated compostables would go to a composting facility. As opposed to the composting of mixed waste, the separated compostables would require less preprocessing, would produce a higher quality compost and would produce less residue.

Some materials (such as ferrous metals) could be recovered from the third stream prior to disposal, although yields are expected to be low.

A key issue in the three-stream approach is the public response to the use of three containers. It might be argued that participation rates would be lower than for the Blue Box method because of the greater complexity and because of the unpleasant nature of the compostables. The existence of the third stream remains an invitation to non-participation.

The Wet/Dry Approach:

The wet/dry approach involves sorting waste into two categories: wet (and dirty) and dry (and clean). The dry waste is sorted at central facilities to remove recyclables and the wet waste is composted. No attempt is made to specify to householders what wastes are to be recycled: only that clean and dry materials are to be kept separately. The householder would require two storage containers.

Compared to the three-stream approach, the wet/dry approach would likely result in higher sorting plant residues and lower compost quality.

Problems with the wet/dry approach as practiced in Europe relate to the sorting of the dry stream at the sorting facilities. This work is considered very dirty and difficult, especially in terms of separating out paper products. Problems in attracting and keeping workers for such facilities would likely be significant due to health and safety concerns.

After inspection of dry sorting facilities in Europe, a modified version of the wet/dry approach has been identified as a means of overcoming some of the dry sorting facility problems noted in Europe. In this modified technique, paper and cardboard are collected as a separate stream. The remaining dry fraction would thus be more amenable to mechanical separation than is the traditional dry stream with paper included. It is considered that this modified wet/dry approach would maintain the benefits of higher recovery rates and better public participation than the three-stream approach. A wet collection pilot program is currently underway for 10,000 homes in Metro.

C.03 Solid Waste Reduction, Reuse and Recycling

The term "the 3Rs" - reduce, reuse and recycle - is commonly used today. Together, these methods can provide a significant reduction in the quantity of waste requiring management and disposal. A fourth "R" - recovery - is discussed in the following section of this report.

Waste reduction involves minimizing the quantity of waste generated, thereby reducing waste collection and disposal needs. Reduction efforts have focused on educating consumers, industries and institutions to change their waste generation habits and on the re-design of industrial processes and practices to eliminate or reduce waste generation. Reduction can be achieved by a variety of means, including changed packaging practices, substitution of reusable for disposable items and the manufacture of more durable and repairable products. Waste reduction is the first priority among waste management options.

Appendix C

Waste reuse implies the direct reuse of materials that have served their primary purpose and that would otherwise become waste. The product is reused either directly or after some re-processing. Examples of products that can be reused include bags, boxes, food containers, clothing, etc. Efforts to promote reuse have focused on education, exchange centres and on encouraging the design and manufacture of reusable products.

Waste recycling involves not just the collection of specific materials from the overall waste stream but also the use of these materials in place of virgin materials in the manufacturing process. Recycling initiatives are targeted primarily, but not exclusively, at the residential waste stream. One technique, now the subject of a pilot program in Metro, is backyard composting.

Organic kitchen, yard and garden wastes can be composted by the householder in the backyard. Experience elsewhere indicates that public receptiveness to this type of recycling effort is greatly enhanced by prior participation in curbside recycling programs. Provision of special composting containers has proven effective in increasing participation rates. Metro has recently distributed more than 19,000 home composters as a pilot program. Centralized composting is discussed later in this report.

In terms of non-residential waste, industrial and commercial establishments are the sources of most of the recycled waste paper and metals in Ontario today. Recoverable materials include computer print-out paper, other grades of fine paper, corrugated boxes, boxboard, glass and metals.
Commercial/industrial recycling rates increase or decrease in response to market conditions; generally, materials can be removed at no or little cost to the generator if quantities are sufficient and of good quality. In any case, the generator reduces collection and disposal costs and the purchaser may reduce his raw materials costs. Private sector programs operate in response to market conditions and tipping fees. Municipal initiatives can stimulate private sector recycling; Metro operates a waste exchange and audit service.

Appendix C

Metro Experience:

Metro has recently undertaken a number of waste reduction and recycling initiatives, including the operation of programs and the provision of funds, services and information to encourage and facilitate recycling activities.

In 1988, the Blue Box program commenced. Metro funding includes grants to area municipalities to cover the net operating costs incurred as well as capital start-up grants for collection vehicles and the containers. Metro receives, transfers and markets the collected source-separated materials. Recycling diversion credits of $20/tonne are paid to area municipalities; $470,000 was paid in 1988 for diverting 30,500 tonnes of material.

During 1988, Metro established a compost site in order to compost municipally collected leaves. This site, at the Avondale Borrow Pit, is one of the largest leaf composting operations in North America, receiving over 7,000 tonnes of leaves in 1988, with 60,000 tonnes anticipated in 1989.

Metro also established in 1988 four permanent household hazardous waste depots (at the Brock West and Keele Valley landfills and the Ingram and Scarborough transfer stations) as well as the "Toxics Taxi" program to collect these wastes.

Promotion and public education of waste reduction and recycling in 1988 included television commercials, newspaper advertisements, displays and the distribution of booklets and fact sheets. In 1989, Metro will publish the "Householders Guide to Waste Reduction and Recycling", providing detailed suggestions for dealing with domestic wastes.

Under the Recycling Opportunity Notice Program, personnel at all Metro disposal facilities visually inspect loads of incoming waste to identify those with high proportions of recyclable materials. The Industrial Waste Reduction Co-ordinator then encourages the haulers and generators to recycle future loads and assists in finding a market for the material; during 1988, approximately 2,000 notices were handed out, resulting in a diversion of 8,000 tonnes.

The Waste Identification Program was initiated in 1988 to further monitor private sector waste. Also initiated in 1988 were waste audits, wherein Metro staff visit plants and businesses to review waste management practices and develop strategies to reduce and recycle waste. Further, a comprehensive recycling market directory was prepared, an Industrial Waste Reduction Hotline was established. A corrugated cardboard ban on loads with more than 20% by volume was established at all Metro facilities as of September 1, 1989.

Costs:

Derivation of recycling costs and comparison between programs is difficult because of the many factors involved: levels of service, different grants, diversion credits available, promotion activities, types of materials recycled, market conditions, etc. Net operating costs will depend upon the current prices for recycled materials.

Metro covers the net operating costs of area municipality blue box programs as well as providing capital assistance.

The Ontario Ministry of the Environment (MOE) provides financial support for residential recycling and also has funding programs targeted at the industrial waste stream. Further support is provided through technical and promotional activities.

Another funding source is the Ontario Multi-Material Recycling Inc. (OMMRI), established by soft drink container-related industries primarily to support multi-material recycling programs. The focus of OMMRI's program is to provide capital grants and promotional assistance to recycling operators.

Appendix C

Other Issues:

While the 3Rs have been identified as the preferred approach to waste management and while efforts are being made to increase the amount of waste reused, recovered and recycled, the availability and volatility of markets for recycled goods are still an important consideration.

Recycled materials are commodities subject to the same forces of supply and demand as other commodities. Recycling will occur when supplies of used materials can be obtained at sufficiently low prices that new products can be manufactured and marketed at prices competitive with products manufactured from virgin materials. The price of used material must be low enough to enable removal of contaminants - and the technology must be available to enable this to be accomplished.

Recycled materials are also considered "secondary" materials and as such compete against virgin materials usually of superior quality. For some potentially recyclable materials, markets do not exist because industrial processes cannot economically reprocess the materials. A further consideration is that available markets in Ontario are finite and may not be able to absorb the full amount of materials recycled. In such cases, markets will require development. The issue of markets for recovered materials is explored in depth in Discussion Paper 3.5.

A final consideration is that current technology and industrial processes as well as economics make recycling limited in terms of the proportion of solid waste that can be so handled. Current recycling efforts in Metro appear to be handling about 10% of the waste stream. This still leaves considerable quantities of waste requiring management.

C.04 Materials Recovery After Collection

Materials recovery is the separation of recoverable materials from mixed solid wastes after collection. Materials recovery can serve as a separate process but is usually undertaken in conjunction with such processes as composting, energy-from-waste (EFW) or refuse derived fuel (RDF) production. The quantity of materials recovered from mixed municipal waste is usually in the order of 5 - 10% of the waste processed, although higher rates can be achieved where kitchen and garden wastes are segregated at source. When used in conjunction with other processes, materials recovery is incidental, the primary purpose being to improve operations and the quality of the end product.

The trend in materials recovery has been to less mechanized, simpler, more labor intensive processes. This has reduced handling problems and has resulted in lower capital and operating costs. The most commonly recovered materials are:

- ferrous metals using magnetic separation
- corrugated cardboard by hand picking
- newspaper by hand picking
- aluminum by induced current magnetic separation
- plastic by hand picking or air separation.

When used as a separate process (rather than as a preliminary activity in other processes), handling methods are generally designed to be labor intensive and opportunistic. When a potentially high value waste load is recognized, it can be diverted to hand picking operations before being mechanically processed. In some instances, materials recovery may be no more than systematic hand-picking of waste loads yielding high proportions of salvageable materials. This can take place at transfer stations, incinerators or even at landfills, given sufficient space.

Ontario Experience:

Ontario experience with mixed waste materials recovery includes the Hugh Cole Resource Recovery Centre in St. Catharines and the Ontario Experimental Resource Recovery Plant in Metro. The Hugh Cole facility operated for eight months in 1985 until a fire halted operations; approximately 6% of the waste was recovered into recyclable materials. The Metro facility, established by the MOE as an experimental and demonstration plant, ceased operations in 1986; it is now used as a transfer station.

C.05 Composting

Composting is a process that converts organic material to a stable product that is useful as a soil conditioner and low strength fertilizer. Any non-plastic, organic waste may be composted, including kitchen waste, yard waste, sewage sludge, paper and finely chopped wood waste. Organic waste may be also be obtained from commercial/industrial establishments in the food processing and restaurant industries. Composting of organic waste can process up to 35% of the municipal waste stream and may produce a potentially useful product.

Sewage sludge may be composted separately if dewatered or combined with other solid waste ("co-composting"); compost incorporating sewage sludge may not be acceptable for application to food crops.

The basic approach to composting involves arranging the prepared waste into open piles or windrows; this technique requires a large area to handle municipal scale quantities and the Canadian climate requires that protection be provided to control moisture content.

Appendix C

Composting of mixed solid waste is well established in Europe; as of 1987 there were 17 facilities processing 600,000 tonnes of mixed waste and sewage sludge per year and another 45 facilities composting only sewage sludge. The mixed waste compost has, however, generally proven to be of low quality and the trend appears to be towards composting segregated organics, thereby improving product quality.

Mixed waste composting may be considered as a pretreatment technique prior to landfilling. The advantages of this extra step are: (1) waste would be aerobically stabilized; (2) waste volumes to landfill would be reduced significantly; (3) the waste landfilled would produce little or no methane odour. The costs of such uncomplicated composting is relatively low because little feed preparation or product finishing is required.

Ontario Experience:

Windsor composts sewage sludge from a primary treatment facility in an extended open pile system. The compost is used primarily for landfill rehabilitation.

In Niagara Falls, Grow-Rich Waste Recycling Systems Inc. operates a composting facility using mixtures of paper sludge, manure and industrial plant wastes. The product is sold on the horticulture and farm markets.

In Metro, a leaf composting operation has been established at the Avondale Borrow Pit. In 1988, 7,000 tonnes of leaves were received and it is forecast that 60,000 tonnes will be handled in 1989. As well, Metro is currently in the design stage for a 190 tonne/day composting facility.

Costs:

Windrow and open pile processes are characterized by relatively lower capital and energy costs and higher operating costs and large space requirements. It is estimated that a 400 tonne/day facility would have a capital and operating cost of approximately $50 per tonne. A design study for a 190 tonne/day facility for Metro is presently underway and cost estimates will then be refined. Coarse compost from mixed waste is estimated to cost approximately $25 per tonne.

Other Issues:

Markets are a key concern for compost producers. There are public concerns that any compost derived from solid waste will contain unacceptable levels of heavy metals, pathogens or other contamination. Compost derived from municipal solid waste has demonstrated effectiveness and public acceptance in horticultural uses such as landscape gardening, parkways and rights of way, sod farms and reforestation schemes. Development of markets and acceptable applications will be required if composting is to play a significant role in the waste management process.

C.06 Incineration

Incineration is used to reduce the volume of waste; with heat recovery, known as energy-from-waste (EFW), energy is produced in the form of steam, hot water and/or electricity.

There are a number of technologies used today in waste incineration, with or without energy recovery. Any facilities would include up-front waste sorting and separation. The technologies include:

Mass Burning - the dominant technology for mid-size and large refuse incineration plants around the world, currently considered for capacities of about 180 to 3000 tonnes per day. A major advantage is that the waste stream requires little preparation. Mass burning requires highly efficient pollution control equipment; as well, capital costs are high and maintenance costs can be significant.

Two Stage Combustion - relative simplicity leads to lower capital costs than mass burning; is limited in terms of capacity - a 100 tonne per day module is the largest size currently available.

Semi-Suspension Burning - requires a significant degree of waste pre-processing. The design may be particularly well suited to incineration of the waste remaining after recyclable material, non-combustibles and wet wastes suitable for composting have been removed from the waste stream.

Fluidized Bed Combustion - advantages include lower operating temperatures and consequent reduced NO^X emissions, bottom ash and fly ash. A disadvantage is the high degree of waste pre-processing required. This technology is not yet fully established for municipal solid waste.

Rotary Kiln - has been used in chemical waste management, including the handling of hazardous combustible wastes and container drums. Its rugged construction can withstand problems associated with heterogeneous waste combustion. Capital costs are higher than for two-stage combustion units but lower than for mass burning.

Three newer technologies are sometimes mentioned in relation to the incineration of municipal solid waste: pyrolysis, plasma torch and liquid oxidation. None of these technologies has yet been proven for the large scale and heterogeneous waste characteristics inherent in municipal waste.

European Experience:

Incineration with and without energy recovery has a long history in Europe, where the availability of land for waste disposal and the high cost of energy have made this waste management method viable.

In Sweden, some 50% of household solid waste is now incinerated. Incineration with energy recovery is the favored approach to landfill diversion and most of the facilities supply district heating needs. Current plans call for incineration with energy recovery to handle 70% of the waste stream by the year 2000.

At present, West Germany incinerates about a third of its household refuse. Most installations are mass burning facilities with the energy recovered in the form of electricity, steam or hot water for district heating. West German regulations require that all waste be incinerated after hazardous and recyclable materials have been removed.

Denmark incinerates over half its municipal wastes. Because of concerns regarding air emissions, restrictions on the use of incinerators are being considered. In Copenhagen, incinerator ash is used for road building and construction.

Canadian Experience:

As outlined in **Exhibit C-1**, there are a number of new and recently built energy-from-waste facilities operating in Canada, representing the spectrum of incinerator technology. These facilities incinerate municipal solid waste.

Mass burning energy-from-waste plants are located in Quebec City (920 tonne/day) and Vancouver (720 tonne/day). A two-stage incinerator is operating in Charlottetown, P.E.I. (100 tonne/day) and a second plant of this type has been recently completed in London, Ontario (270 tonnes/day). The semi-suspension incinerator known as a Solid Waste Reduction Unit (SWARU), of 600 tonne/day capacity is operating in Hamilton. Also in London, Ontario, 3M Company operates a rotary kiln facility of 60 tonnes/day capacity, burning waste from private haulers as well as its own paper and plastic wastes.

A proposal by Petro-Sun/SNC for the installation of 360 tonne/day two-stage incinerator has received government approval to proceed in the Region of Peel. Energy recovered will be sold to a nearby industrial plant or as electricity to Ontario Hydro. The plant will handle about 20% of the municipal waste generated in the Region.

St. Lawrence Cement Co. is presently studying the feasibility of an RDF facility near Metro.

Appendix C

Metro Experience:

In Metro until recently, incinerators were in common use in apartment buildings; it is estimated that some 600 units were in service in Metro in 1987. Ontario regulations were introduced in 1987 to phase out apartment incinerators by the end of 1988.

From the 1930's to the 1967, the area municipalities within Metro operated several incinerators ranging in capacity from 20 - 600 tonnes/day. Air pollution problems have led to the closing of all facilities. The last remaining plant, Commissioners Street, was shut down to reduce emissions in 1988; it is a mass burning facility with a 900 tonnes/day capacity.

Presently, Trintek System (Ontario) Inc. is proposing a 400 tonne/day mass burning plant on Commissioners St. to burn waste from commercial haulers; steam and electricity would be sold to an industrial facility across the street.

Waste from international airline flights is required to be destroyed by incineration under Agriculture Canada regulations. Until recently, this waste from Lester B. Pearson International Airport was incinerated at the Commissioners Street facility; upon the closing of this facility last year, the waste now goes to the SWARU facility in Hamilton. A 40 tonne/day facility has been proposed for the airport.

Costs:

Due to the significant differences in design from plant to plant, costs are difficult to estimate. Capital costs are affected by pollution control requirements, waste feed pretreatment, automation and monitoring systems, site costs, etc. Grants from provincial and federal governments as well as tax treatment are also significant factors. Similarly, operating costs can be difficult to forecast, especially where the energy recovered may have to be sold at low prices that do not accurately reflect the capital and operating cost of the EFW facility.

Recent data indicate that facility capital costs are in the range of $100,000 to $150,000 per tonne installed daily capacity. The recently completed Victoria Hospital facility in London, including energy recovery, is estimated to have cost approximately $110,000 per tonne installed daily capacity.

Operating costs vary with plant design and scale and increase with the stringency of emissions regulations; they are estimated in the range of $25 to $40 per tonne throughput but would be offset to some degree by energy sales. It is estimated that a range of $60 to $75 per tonne throughput, including energy revenues and capital and operating costs, is a reasonable estimate of the net cost that would be borne through tipping fees or through taxation.

Other Issues:

Public concern regarding incineration often centres on questions of air emissions and subsequent risks to public health. The poor emissions records of earlier facilities and growing awareness of the effects of such emissions as dioxins and acid gases ensure there will be considerable public scrutiny of any incineration plant. There are also some questions about incinerator fly ash as a source of heavy metals and dioxins.

Facility siting is an important consideration. Because energy recovery is a key element in plant design, the facility must be reasonably close to the energy users except if the energy is sold to the Hydro grid. Other siting issues include traffic, noise and odor disturbances in the facility area.

The potential markets for the energy produced through incineration include district heating systems; large industrial steam users (although facility siting in close proximity may be a problem); and electric power utilities (an important market if no suitable hot water or steam users are found).

C.07 Refuse Derived Fuel

Refuse derived fuel (RDF) is usually produced from domestic waste and selected types of commercial and industrial waste. Non-combustibles are removed from the waste stream and the residual material is processed into the desired form: "fluff" RDF is the result of size reduction and "pelletized" RDF is produced by compressing fluff (for use where storage or transportation is required). RDF production is undertaken to prepare a consistent quality and size of feedstock for either on-site or off-site dedicated waste incinerators or industrial boilers.

Many RDF processing plants have encountered serious operating problems. Explosions in the shredders and materials handling problems that lead to disturbance of the incineration process are frequent.

In terms of RDF economics, part of the fuel cost reductions achieved in using the product as a substitute for other fuels may be offset by increased emissions control requirements and the disposal of ash.

The production of RDF for co-firing with coal has been attempted in 13 plants in the U.S. since 1975. To date, seven of the plants have been unable to produce suitable fuel at economic prices and have closed. RDF has, however, been successfully used in three cement kilns (in Britain, West Germany and the U.S.) at rates of 5 - 45 tonnes per hour.

There are currently three RDF-production plants reported to be operating successfully in the U.S. One facility, in Delaware, processes 240,000 tonnes/year of waste and produces fluff at a rate of .5 tonne RDF per tonne waste. This plant also produces compost. The facility has been in operation since 1975.

There is only limited experience with RDF in Ontario. The SWARU facility in Hamilton was a first generation installation producing fluff for two semi-suspension incinerator units. Explosions in the shredding units and waste quality variability resulting in inconsistent feed quality and rate have been problems.

Costs:

Most RDF facilities have proven to be cost ineffective due to high processing costs and lack of markets for the RDF itself (extensive modifications must be made to boilers and air pollution control equipment not specifically designed for RDF burning). Lack of markets for materials recovered in the waste processing step further reduces economic viability. Some recent cost estimates indicate that capital and operating costs, net of revenues from the sale of recovered materials, are in the range of $50/tonne throughput.

C.08 Landfill

Landfilling is the most common way of managing solid waste in most North American communities. Landfilling is a necessary component in any solid waste management system because some portion of the waste stream is non-processable or is a process residue.

Some important aspects to bear in mind while considering landfilling are:

- given present and probable technology, a landfill is required; the amount of waste that will require landfilling depends on the type of waste generated and on the other solid waste management approaches taken;
- landfill is required as back-up or standby to other facilities during maintenance and down times due to mechanical breakdown, labor difficulties or temporary market interruptions;
- most waste management techniques produce a process residue (e.g., ash from incineration) for which disposal by landfilling may be the only approach;

- seasonal variations in the composition of waste may require the increased use of landfill at certain times of the year;

- once waste has been designated for landfilling, there are techniques available to reduce the volume of the waste and operating problems of landfilling; common methods include waste compaction, shredding and baling and possibly coarse (aerobic) composting all organic fractions of the waste prior to placement into the landfill;

- methane gas generated by the decomposition of organic material can be collected; collection systems protect the environment by controlling off-site migration and odors and can yield financial benefits through sale or use of the gas (captured gas typically contains 40% - 55% methane).

The construction and operation of a landfill is as important as the selection of a suitable location. Construction includes access road improvements, land clearing, earthworks for cell development, drainage systems, cover and topsoil piling, offices, scales, maintenance facilities and installation of liners, leachate collection and treatment systems and methane gas collection systems.

Landfill operation involves such concerns as waste inspection (municipal landfill sites are designed to handle only solid non-hazardous waste), security, surface and groundwater monitoring, leachate collection and methane gas control. Haul roads, weigh scales and other facilities also require regular maintenance and litter and vector control programs are necessary.

Proper site closure and post-closure measures and maintenance programs are mandatory to satisfy environmental and public health concerns. Closure, or site rehabilitation, includes placement of final cover, vegetation and landscaping. Post-closure and perpetual care activities include site maintenance, monitoring of surface water, groundwater and methane gas and leachate collection; these activities require the establishment of reserve funds during the site's operation.

It must be considered that landfilling is a useful waste management approach for four key reasons:

- it is the most flexible in that it can accommodate changes in quantity
- it can manage all types of non-hazardous solid waste
- it is reliable and relatively easy to operate
- it is not dependent on any outside markets or other forces to retain its cost advantages.

Metro's Experience:

Opposition to landfill siting has increased throughout Ontario because of the growing awareness of the actual or possible environmental impacts of landfills and because of the nuisance of landfill operations on residents of the area. In the greater Metro area, this is further aggravated by the perception of residents in surrounding municipalities that "it's not our garbage". Residents of municipalities where Metro currently operates landfills are vocal in demanding more aggressive efforts to reduce waste volumes prior to landfill.

Close scrutiny by the public of potential environmental and nuisance impacts is likely to result in high levels of control in the selection of sites and in site planning, design and operation. This will impact on facility operating costs.

Both of Metro's landfills (Brock West and Keele Valley) are located in sand and gravel pits, although at distinctly different sites. Each site is developed in a cell by cell fashion. Each cell is lined with clay to provide a low permeability liner that serves to deflect leachate to the collection system. The leachate is then directed to a pumping station and eventually to a waste water treatment plant.

At both landfills, daily cover is used to reduce odors, litter and vectors. Metro has installed an extensive gas control facilities at both sites to further reduce odors.

Costs:

Landfilling costs vary significantly depending on such factors as site location, quantity of waste handled and lining requirements. Current estimates for large scale landfills meeting all MOE requirements are in the range of $25 per tonne.

C.09 Waste Export

In Metro's context, waste export refers to the export of waste to solid waste management facilities owned and operated by other jurisdictions or by the private sector outside Metro. The use of existing or proposed facilities owned and operated by others but located within Metro is not considered export; neither is the use of Metro-owned and operated facilities located outside Metro (e.g., Brock West and Keele Valley landfills).

Important considerations relevant to exporting solid waste include:

- up-front capital costs may be avoided but this may be offset by higher tipping fees and transportation costs;
- the question of long term reliability in terms of cost and availability; the exporter has no control over the waste disposal facility;
- exporting waste to another jurisdiction raises public concerns about using "someone else's backyard";
- sole dependence on export would leave Metro without a back-up facility;

- potential export options may not manage all or even a significant portion of the waste generated in the study area; therefore, other approaches will be required;

- long-term contracts with other jurisdictions may include an "environmental escalation" clause, allowing the owner to pass on to the user the costs of future necessary improvements to the facility.

C.10 Metro Toronto Activities to Date

In the approximately two years since the inception of the SWEAP planning process, solid waste management has been a prominent public issue. The following paragraphs outline some of the important actions and decisions taken over this time period.

A landfill site search has been ongoing since 1986. Seven interim landfill sites were identified of which three are considered capable of accommodating the waste disposal needs of Metro and the Region of Durham in the short term until a long-term site(s) is identified through the SWEAP process. Investigations have been underway to evaluate the feasibility of extending the Keele Valley and Brock West Landfills. Further evaluation and eventual selection of an interim landfill site is presently in abeyance.

Metro, in an April 1989 Council decision, set a target of a 30% decrease (over 1987 levels) in waste tonnages, to be achieved by 1992 through waste reduction and recycling. In order to help meet this target, Metro has increased tipping fees charged to private haulers from $50/tonne at Metro landfills to $85/tonne and from $65 to $100/tonne at transfer stations. Other recommendations included:

- setting user fees for area municipalities (rather than payment through taxes);
- establish multi-material curbside recycling for apartments and commercial areas;
- reduce the frequency of non-separated waste collection;

- proceed with the establishment of a 190 tonne/day composting facility;
- ban the following materials from Metro disposal sites as soon as recycling or other disposal sites are available: tires, wood waste, leaves, white goods, demolition and construction waste, waste drywall, incinerated sewage sludge ash and digested sewage sludge;
- encouraging provincial and federal governments to expand office paper recovery programs and to take immediate steps to reduce non-recyclable or re-usable packaging;
- requesting MOE to order that waste from Metro be disposed of at other municipal and/or private landfills within an economic haul distance when the remaining approved landfill capacity at Metro's existing facilities is reduced to one year.

In January 1989, Metro adopted a resolution to proceed with a wet/dry waste separation pilot project.

In February 1989, Metro's Works Committee recommended the establishment of a $1.2 million pilot project to set up 19,000 backyard composters. Under the program, residents pay $25 for the composting unit, with Metro and the provincial government picking up the remaining $75. The program could result in diverting about 1600 tonnes of waste per year from landfills.

APPENDIX D

Factors That Will be Used to Develop Criteria to Evaluate Solid Waste Management Programs and Technologies

APPENDIX D
FACTORS THAT WILL BE USED TO DEVELOP CRITERIA TO EVALUATE SOLID WASTE MANAGEMENT PROGRAMS AND TECHNOLOGIES

PUBLIC HEALTH AND SAFETY

- potential effects on people, neighbourhoods, and communities
- risk assessment
- worker safety

NATURAL ENVIRONMENT

- potential releases to the natural environment
- potential effects on air, land, water and biota
- noise and odour considerations
- special siting considerations or constraints
- long-term and perpetual care monitoring requirements

SOCIAL/CULTURAL

- site size and location
- land requirements for facility operations and buffer
- existing and proposed land use
- public acceptability
- resource recovery potential - priority to waste reduction and reuse
- siting requirements and compatibility with a variety of land uses including consideration of existing and proposed land use designations, policies in approved official plans and by-laws
- heritage, archaeological and cultural features
- aesthetics
- potential end use benefits or impacts

LEGAL/JURISDICTIONAL

- compensation policy and requirements
- intervenor funding requirements and policy
- expropriation and compensation
- approval and hearing requirements
- inter-jurisdictional requirements

APPENDIX D - CONTINUED

ECONOMIC/FINANCIAL

- planning and acquisition costs
- capital, operating, maintenance costs
- closure and post-closure costs
- cost of mitigative and enhancement measures
- effect on annual Area Municipal costs and budgets and municipal financial capability
- cost of supporting facilities
- cost of proposed tipping or user fees
- existence, availability and security of markets - revenues from sale of recoverable materials, energy, etc.
- availability of financing and grants
- intervenor funding
- compensation policy
- private/public sector roles
- business and employment effects
- costs of displacing and/or effecting existing uses
- effects of requiring Canadian and local content

TECHNICAL

- percentage of total waste managed - applicability to Metro Toronto and Provincial diversion objectives
- wastes potentially managed
- effect on other programs and facilities proposed
- minimum waste load required to operate facility
- adaptability to different types of waste
- flexibility to changing quantities and/or characteristics of waste
- historical operating experience
- reliability and operating life of the technology and facility
- operational complexity and sensitivity
- secondary treatment, residuals treatment and disposal requirements
- energy and utility requirements
- type and extent of mitigative and enhancement measures required
- closure and post closure requirements
- effect on land disposal requirements
- potential traffic effects

Source: The Proctor & Redfern Group "Phase Two Report Metropolitan Toronto Solid Waste Management Appraisal Study, Volume B - Appendices - Working Paper No. 4 - Evaluating Approaches to Solid Waste Management: Criteria and Site Selection (Table 2)", December 5, 1989.

APPENDIX E

Metro Council Policy Statement and MOE Statements on Diversion Goals

APPENDIX E
METROPOLITAN COUNCIL DECISION
SOLID WASTE MANAGEMENT PLAN FOR THE GREATER TORONTO AREA

On April 26 and 27, 1989, the council of the Municipality of Metropolitan Toronto adopted recommendations that the Metropolitan Corporation:

1. Endorse the Provincial targets for waste diversion from landfill of 25 percent by 1992 and 50 percent by 2000 (based on 1988 landfill rates adjusted for population growth), a further reduction beyond the year 2000 to be established;

2. Continue to implement all approved programs, activities, facilities, studies and pilot projects to meet Metropolitan Toronto's waste diversion target of 30 percent by the year 1992;

3. Continue the Solid Waste Environmental Assessment Plan, public participation and public education programs, preparation of a Metropolitan Toronto master plan and coordinate the Solid Waste Environmental Assessment Plan and the Greater Toronto Area solid waste management initiatives until the Greater Toronto Area Authority assumes responsibility for and produces an approved multi-regional master plan, or provides approved facilities and dates of availability that are satisfactory to Metropolitan Toronto;

4. Nominate potential standby waste management capacity within this calendar year that will meet the spirit of the Greater Toronto Area Program Contingency Plan, that could be the M3 or M2 sites in the City of Scarborough Area, or other area, where an agreement can be made with a receptive host;

5. Investigative alternative waste management capacity or sites beyond the Greater Toronto Area, to provide the required capacity up to, and possibly beyond, 1996;

6. Endorse the Chairmen's Proposal on the condition that:

    (i) the words "call for proposals" or "proposal call" are substituted with the words "call for expressions of interest";
    (ii) the requirements of the Environmental Assessment Act will be complied with in respect of long term planning initiatives;
    (iii) the draft terms of reference for the call of expression of interest will be approved by Metropolitan Council through the Works Committee; and

(iv) Metropolitan Council and the Regional Municipalities will not proceed with any formal call for proposals until the process set out in Recommendation No. 3 is completed.

7. Provide funding up to an amount of $1,040,635.60 representing Metropolitan Toronto's contribution to implementation of the Greater Toronto Area Proposal during the interim period 1989 and 1990.

Metropolitan Council also adopted recommendations that:

8. Staff be authorized to give effect to the foregoing recommendations; and that the Commissioner of Works review and submit a further report on the Corporation's Solid Waste Environmental Assessment Plan and the Greater Toronto Area Proposal, after the proposals have been received and evaluated;

9. The Commissioner of Works be authorized to consider and investigate with the co-operation of the four regional municipalities, and to report back to the Metropolitan Council through the Works Committee on Metropolitan Toronto becoming a proponent or co-proponent within the context of the Chairmen's Proposal and that previously authorized funding for the interim site search be available for such purpose.

10. The Commissioner of Finance be requested to report to the Metropolitan Executive Committee on options for public sector funding of a public region waste authority;

11. The Chairman of the Works Committee be appointed as the other elected representative on the Solid Waste Interim Steering Committee in addition to the Metropolitan Chairman,; and

12. Metropolitan Toronto's representatives on the Solid Waste Interim Steering Committee seek advice and direction from Metropolitan Council, through the works committee, on all major matters of policy and, in any case, report on the progress of the Steering Committee's work at least every two months.

Metropolitan Council further adopted recommendations that:

13. Metropolitan Council endorse the principle that the first components of its solid waste management plan will be reduction, reuse, recycling and recovery.

APPENDIX E - CONTINUED

14. The report to Metropolitan Council before year's end, which will confirm Metropolitan Council's interim landfill site, include full details of the environmental evaluation to be undertaken.

15. The Minister of the Environment, Province of Ontario, be requested to notify Metropolitan Toronto as to the feasibility of a comparison of landfill sites under either the Environmental Assessment Act or the Environmental Protection Act;

16. The Solid Waste Interim Steering Committee be authorized to make recommendations to the Regional Municipalities and Metropolitan Toronto, with respect to:

    (i) co-ordination of on-going waste plans in the Regional Municipalities;
    (ii) a regional waste plan for the Greater Toronto Area, which would be in addition to the SWEAP Program.

ATTACHMENT TO ITEM 14.

Ontario

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Ministry
of the
Environment

135 St. Clair Avenue West
Toronto, Ontario
M4V 1P5
416/323-4359

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REPLIED
July 27, 1989

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Your file: 1600.32

Mr. R.G. Ferguson, P.Eng.
Commissioner of Works
Metropolitan Works Department
The Municipality of Metropolitan Toronto
Phoenix House, 9th Floor
439 University Avenue
Toronto, Ontario
M5G 1Y8

Dear Mr. Ferguson:

Thank you for your letter dated May 30, 1989 regarding incineration. You will note that in my statement of March 10, 1989, the Province has established a goal for fifty per cent diversion of solid waste from landfill and incineration by the year 2000. This position was re-affirmed in the Throne Speech this year.

Therefore energy-from-waste (EFW) incineration is not considered as a contributing factor to the 50 per cent diversion.

This Ministry is encouraging reduction, reuse and recycling of materials as high priorities.

I trust this addresses your question. If you have any further need for clarification, please do not hesitate to contact me.

Yours sincerely,

Jim Bradley

Jim Bradley
Minister

cc: Allan Tonks
Chairman, Metro Toronto

Ontario

news release

Ministry
of the
Environment

March 10, 1989

FOR FURTHER INFORMATION:

Adam Cuilini (416) 323-5151
Waste Management Branch

Michael Lewis (416) 323-4327
Communications Branch

PROVINCIAL PLAN TARGETS OF 25 PER CENT RECYCLING BY 1992, 50 PER CENT BY 2000

Ontario will divert to constructive uses 25 per cent of its household and commercial-industrial waste by 1992 and 50 per cent by the year 2000, Environment Minister Jim Bradley announced today.

"We must divert mountains of garbage from landfill and incineration by recycling used resources back into the production stream", Mr. Bradley said. "To win our war on waste we will involve the householder, the office worker, the student, the banker and the baker."

Specific steps the province will take to achieve these goals include:

- The government will put its own house in order. This includes purchasing policies supporting markets for recycled products, restrictions on non-recyclable/non-reusable goods within government and maximum recycling or recovery of materials such as office paper and cafeteria wastes. The government's goal is to reach the 50 per cent target well before the year 2000 and to share its experience with municipalities, the private sector and the federal government.

.../2

- Expanding Blue Box recycling. Additional products such as mixed plastics, boxboard and corrugated cardboard will be recycled and household recycling service will be extended to apartment dwellers. By 1995, close to 3 million Ontario households will be recycling.

- Composting organic wastes. The province will contribute an estimated $50 million over 10 years to municipalities to assist householders in setting up home composting units, and to set up central municipal composting units.

- Private sector waste reduction. Key sectors -- such as office towers (fine paper), construction companies (gypsum wallboard waste), commercial plazas (corrugated cardboard), food wholesalers and retailers (corrugated cardboard and organic waste), and fast food outlets (packaging and organic wastes) -- will be expected to develop 4Rs programs with provincial help.

  Regulations will be introduced where voluntary measures do not achieve desired results.

  The province will share these costs with the private sector. The provincial share is expected to be $80 million through the year 2000.

- Research Advisory Committee. The Environment Ministry's Research Advisory Committee will provide government assistance to research and develop new and innovative 4R technologies and markets. These funds are expected to total $50 million by the year 2000.

.../3

- True cost tipping fees. The province will urge all municipalities to charge for waste received at treatment and disposal facilities and to use these monies to establish a reserve fund. The charges should reflect the full operating and replacement costs of waste management facilities. Such a fund would place waste management, including the development of new disposal facilities, on a self-sustaining financial footing. More importantly, it would promote the development of 4Rs activities by establishing a level playing field for 4Rs options to compete fairly with disposal on purely economic grounds.

  Municipalities will also be urged to implement a direct user charge to all commercial and industrial users. This approach has the benefit of encouraging waste generators to reduce waste quantities.

- Recycling regulations. The government will introduce legislation clarifying the province's power to make 4Rs activities mandatory. It will then be possible to recover particular recyclable materials prior to landfilling and incineration.

- Powers to withhold certificates. The Government plans to introduce legislation to enable it to withhold Certificates of Approval for waste management facilities unless 4Rs diversion is built into the front end of these activities. This will enable the Ministry of the Environment to prohibit landfills and incinerators from receiving waste that technically and economically could be recycled.

- Hot-line. Trained Environment Ministry staff will offer telephone assistance on technical matters such as interpretation of regulations, funding programs, technology data sources from around the world, and names and addresses of operators of similar facilities or programs. The hot-line will be initiated in 1990 and will become a hub of information-sharing on 4Rs issues.

.../4

- Information to go. Ministry technical staff trained in waste reduction and recycling technologies will be available to visit plants and municipalities to offer on-the-spot information and recommendations. They will discuss proven methods and provide detailed information. This team of technical advisors will be available to municipalities, industry and the commercial sector by 1991.

Cost of the two information services are estimated at $5 million a year.

Total costs to the province of the measures aimed at reaching the 50 per cent diversion rate are estimated at $225 million.

STATEMENT AT A NEWS CONFERENCE
PRESENTED BY
THE HONOURABLE JIM BRADLEY
ONTARIO MINISTER OF THE ENVIRONMENT

NEW RECYCLING TARGETS FOR ONTARIO
MARCH 10, 1989
(CHECK AGAINST DELIVERY)

In the past, we have treated our resources as infinite and expendable. This has led to reckless resource use and growing waste management problems.

Several steps have been taken in recent years to address this outmoded way of using our resources.

Since 1985, this government has increased funding ten-fold for household recycling. Municipalities and industry have joined in. Our Blue Box curbside recycling program has expanded from 40,000 households in 1985 to 1.4 million today. We have launched STAR, our school recycling program, and have initiated the industrial recycling fund, currently at $2.5 million a year.

These programs form a good base, but we need to expand upon them. We need to set goals and achieve them. We must challenge ourselves, and use our ingenuity to turn our throw-away society into an environmentally sustainable society. We must divert mountains of garbage from landfill and incineration by recycling used resources back into the production stream.

Today, I am announcing our government's provincial goals for diversion of municipal solid waste from landfill and incineration.

By 1992, we aim to divert 25 percent of this waste -- both household and commercial industrial -- to reuse, recycling, reduction and recovery.

By the year 2000, we aim to divert from landfill and incineration half of Ontario's garbage.

Every community and institution in Ontario, including the Provincial government, will have to change its wasteful ways to achieve these reduction and recycling goals.

For starters, Queen's Park must practice what it preaches. This spring, my colleague, Minister of Government Services Richard Patten, will announce details of a comprehensive waste reduction and recycling program.

- ° The Government of Ontario will put its own House in Order. The Government will adopt environmentally sensitive purchasing policies which support markets for durable and recycled products, impose restrictions on non-recyclable/non-reuseable goods within Government, and maximize the amount of waste diverted from disposal through recycling such materials as office paper and cafeteria wastes. Through these initiatives, our Government aims to achieve 50 percent reduction in its waste well before the year 2000. We will, of course, be pleased to share information gained through this effort with municipalities, the private sector, and the federal government.

To win our war on waste, we will involve the householder, the office worker, the student, the banker and the baker.

We propose to involve all these Ontarians and more in a provincewide diversion effort. To reach our diversion goals, our government intends implement a number of reforms and programs:

- Expansion of Blue Box Recycling

The government is committed to expanding municipal recycling programs. Additional household wastes, such as mixed plastics, boxboard, and corrugated cardboard will be collected. Recycling service will be extended to apartment dwellers. New communities continue to start Blue Box programs. The Ministry projects that the year 1995, nearly three million (or 75 percent) Ontario home will have household recycling service.

Ontario has already benefited from strong financial and technical support from the soft drink industry via Ontario Multi-Materia Recycling Incorporated (OMMRI).

The establishment of an expanded OMMRI-type structure to flow pr sector funding is essential for this expansion. The Ministry of Environment has already launched consultation with key industrial sectors. If necessary, the government is prepared to develop regulations which will ensure participation by all relevant industries. In Ontario, industries must take responsibility for environmental fate of their products.

We have had excellent counsel from our Recycling Advisory Committee which we plan to expand and rely upon for help in meeting our diversion goals

- Composting of Organic Wastes

Organic wastes make up nearly one-third of total household waste volumes. The province is committed to contributing to a program to provide home composting units to householders who want to locate one on their property, and to aiding municipalities in setting up collection systems and communal composting facilities. Pilot projects will be launched later this year, to be followed by a provincewide effort. The provincial share of these costs is estimated to be $15 million for household composting and $35 million for communal composting projects over the next eight years.

Additionally, municipalities will be aided in diverting autumn leaves and Christmas trees from landfill. The leaves will be composted, the trees chipped and recycled on parkland pathways.

- Private Sector Waste Reduction

Key sectors -- such as office towers (fine paper), construction companies (gypsum wallboard waste), commercial plazas (corrugated cardboard), food wholesalers and retailers (corrugated cardboard and organic waste), and fast food outlets (packaging and organic wastes) -- will be expected to develop 4Rs programs with provincial help.

Regulations will be introduced where voluntary measures do not achieve desired results.

The province will share these costs with the private sector. The provincial share is expected to be $80 million through to the year 2000.

- **Research Advisory Committee**

The Environment Ministry's Research Advisory Committee will provide government assistance to research and develop new and innovative 4R technologies and markets. These funds are expected to total $50 million by the year 2000.

- **True-cost Tipping Fee**

The province will urge all municipalities to charge for waste received at treatment and disposal facilities and to use these monies to establish a reserve fund. The charges should reflect the full operating and replacement costs of waste management facilities. Such a fund would place waste management, including the development of new disposal facilities, on a self-sustaining financial footing. More importantly, it would promote the development of 4Rs activities by establishing a level playing field for 4Rs options to compete fairly with disposal on purely economic grounds.

Municipalities will also be urged to implement a direct user charge to all commercial and industrial users. This approach has the benefit of encouraging waste generators to reduce waste quantities.

° Powers to Make Recycling Regulations

The Government will introduce legislation clarifying the province's power to make 4R activities mandatory. It will then be possible to recovery of particular recyclable materials prior to landfilling and incineration.

° Powers to Withhold Certificates

The Government plan to introduce legislation to enable it to withhold Certificates of Approval for waste management facilities unless 4Rs diversion is built into the front end of these activities. This will enable the Ministry of the Environment to prohibit landfills and incinerators from receiving waste that technically and economically could be recycled.

° Hot-Line

Trained Environment Ministry staff will offer telephone assistance on technical matters such as interpretation of regulations, funding programs, technology data sources from around the world, and names and addresses of operators of similar facilities or programs. The hot-line will be initiated in 1990 and will become a hub of information-sharing on 4Rs issues. Provincial costs are expected to be $0.5 million annually.

° We Come to You

Ministry technical staff trained in waste reduction and recycling technologies will be available to visit plants and municipalities to offer on-the-spot information and recommendations. They will discuss proven methods and provide detailed information. This team of technical advisors will be available to municipalities, industry and the commercial sector by 1991.

Provincial costs for the visiting services are estimated at $4.5 million annually.

It is essential that the federal government move promptly to expedite changes that will promote 4R options at all levels. The Federal government has jurisdiction over packaged goods coming into Ontario. Federal packaging regulations are essential to limit packages as far as possible to types that are recyclable and/or contain recycled material, and to reduce overpackaging.

Businesses must give priority to purchasing recycled materials and to marketing recyclable products. The private sector must make process changes that will reduce the quantities of waste produced and must become more actively involved in waste re-use, recycling and recovery opportunities.

APPENDIX F

Metro Works Department

Preliminary Solid Waste Management Policies

METROPOLITAN WORKS DEPARTMENT

January 4, 1989

To: Metropolitan Works Committee

From: Deputy Commissioner of Works

Subject: Preliminary Solid Waste Management Policies

Recommendations:

It is recommended that:

(1) this report be received for information at this time subject to a further report recommending these Preliminary Solid Waste Management Policies after they have been fully reviewed by the Solid Waste Environmental Assessment Plan Core Program Public Participation Groups (i.e., Multistakeholder Committee and Advisory Caucuses); and

(2) that pending the further report referred in (1) that we be authorized to use these policies in the continuing development of the solid waste management master plan.

Background:

The solid waste management master planning process requires a municipality to approve a statement of policy from which the solid waste management master plan will be developed. The attached statement of preliminary solid waste management policies have been prepared by S.W.E.A.P. staff in conjunction with legal counsel and consultants. As the plan progresses, Metropolitan Toronto may wish to modify or amend these preliminary policies.

The core groups in the S.W.E.A.P. Public Participation Program are presently reviewing this policy statement and should complete their review early in February. Independently, the core groups through the Multistakeholder Committee have already developed a statement of Guiding Principles, attached, which do not appear to be in conflict with the preliminary master plan policies.

Ferguson

R.G. Ferguson - Deputy Commissioner

BW/ww

December 29, 1988

METROPOLITAN TORONTO
PRELIMINARY SOLID WASTE MANAGEMENT POLICIES

Preamble

Metropolitan Toronto (Metro), under the Solid Waste Environmental Assessment Plan (SWEAP), is carrying out a planning process in accordance with the requirements of the Ontario Environmental Assessment Act. The process will lead to the development of a Solid Waste Management Master Plan (Master Plan) and the establishment of solid waste management programs and facilities (System) to implement the Master Plan for a minimum 20-year planning period.

According to the Ministry of the Environment's "Waste Management Master Plan Terms of Reference," master plans should either:

a) form the rationale for subsequent environmental assessment approvals on specific undertakings identified in the plan, or

b) be submitted as an undertaking which includes the plan and the implementation of its specific components for environmental assessment approval.

The development of the System will be guided by policies in the Master Plan that reflect the preferred direction of Metro Council. At a later stage in the planning process, the preferred system will be specifically described, the implementation strategy developed, and a decision reached as to whether or not the Master Plan itself will be submitted as an undertaking under the Environmental Assessment Act.

Preliminary policy direction to guide the planning process is contained in this document.

Preliminary Solid Waste Management Policies

Preparation of Metro's Master Plan will be guided by the following preliminary policies. Metro will:

1.0 PRINCIPLES

1.1 establish solid waste management programs and facilities in a socially, culturally, environmentally, and economically acceptable manner.

1.2 provide the basis for the management of solid waste for a minimum 20-year planning period and ensure that adequate facilities are approved and available.

1.3 maximize the diversion of solid waste from landfill.

1.4 provide the necessary facilities and programs to divert a minimum of 40 percent of total solid waste generated over the 20-year planning period to facilities other than landfill.

1.5 achieve the above diversion policies, to the extent possible within Metro's jurisdiction, through the following solid waste management methods, in order of priority:

No. 1 - reduce the quantity of material becoming solid waste.

No. 2 - reuse material again for the same purpose.

No. 3 - recycle, including material recovery.

No. 4 - compost.

No. 5 - incinerate with energy recovery.

1.6 establish a solid waste management system that is flexible and has adequate back-up potential.

1.7 continue to manage non-hazardous solid waste, including sewage sludge, ash, or process residuals. Management of liquid, hazardous, pathological and radioactive waste is not considered part of the Master Plan.

2.0 MASTER PLAN PREPARATION

2.1 develop and implement public education programs respecting the development and implementation of the Master Plan and monitor their effectiveness.

2.2 coordinate, encourage and monitor a public participation program for all sectors of society in the Master Plan, including the planning, development, approval, operation, closure and post-closure of solid waste management programs and facilities.

2.3 establish policies, including a compensation policy, that address any adverse effects of facility siting and development.

2.4 establish policies to guide the provision of appropriate financial assistance to intervenors and other appropriate persons involved in the Master Plan, including the planning, development, approval, operation, closure and post-closure of solid waste management programs and facilities.

2.5 coordinate, encourage and promote programs and initiatives to reduce, reuse and recycle solid waste generated by residential and commercial/industrial sources.

2.6 pursue the development of markets for materials and/or energy necessary to establish and maintain the feasibility of solid waste management programs and facilities.

2.7 investigate appropriate methods for tracking the movement of specific classes and quantities of solid wastes from the generators to Metro's solid waste managment facilities.

2.8 consider, on a case-by-case basis, involvement of the private sector in Metro's solid waste management programs and facilities.

2.9 implement, in an expeditious manner, programs and facilities which do not require approval under the Environmental Assessment Act.

2.10 consider the staged implementation of certain components of the Master Plan.

3.0 FINANCES AND ADMINISTRATION

3.1 provide the necessary financial resources and organizational structure for the Master Plan including the planning, development, approval, operation, closure and post-closure of solid waste management programs and facilities.

3.2 cooperate with the Province and other Ontario jurisdictions on solid waste management matters.

3.3 ensure that available funding assistance from the Province and others is maximized.

3.4 investigate legislative initiatives including the establishment of appropriate enforcement mechanisms for such matters as:

- mandatory recycling,
- mandatory procurement policies,
- reduction in packaging and changes in product design,

- directing Area Municipalities and other users to utilize specified solid waste management facilities,

- prohibitions on the disposal of certain materials in landfill, and

- non-acceptance of certain classes of non-source-separated industrial solid waste.

3.5 investigate the setting of various tipping or other fees for different classes, volumes, or weights of solid wastes, or for different types of facilities, or by use of other criteria.

3.6 provide diversion credits and/or operating cost contributions as necessary to ensure and encourage the reduction, reuse and recycling of solid waste.

3.7 charge Area Municipalities on the basis of the quantity of solid waste requiring management at Metro facilities.

4.0 MASTER PLAN IMPLEMENTATION

4.1 monitor the progress of program and facility implementation in light of the prioritized waste management methods set out in the Principles.

4.2 develop and implement contingency plans to manage solid waste if unexpected delays are encountered in the establishment of long term facilities as proposed in the Master Plan.

4.3 continue to monitor advances in solid waste management occurring in other jurisdictions.

4.4 monitor on a regular basis the effectiveness of the Master Plan and provide formal updates at least every five years.

APPENDIX G

Summary of Waste Types Managed by Each Approach

APPENDIX G

EXAMPLES OF THE TYPE OF WASTE MANAGED BY DIFFERENT PROGRAMS, TECHNOLOGIES AND BY ALTERNATIVE SYSTEM TARGETS (YEAR 2000)

<table>
<tr><th rowspan="2">Waste Management Approach</th><th colspan="3">EXAMPLE OF TYPES OF WASTE MANAGED</th></tr>
<tr><th>Alternative No. 1</th><th>Alternative No. 2</th><th>Alternative No. 3</th></tr>
<tr><td>WASTE REDUCTION AND REUSE INITIATIVES AND PROGRAMS</td><td colspan="3">Waste reduction approaches account for 14 percent of total waste generated for all three system targets as follows:
• public education will enhance social consciousness and increase participation in waste management matters from all sectors of the society. In turn, waste reduction activities will be emphasized as part of society's day to day activities.
• yard waste and kitchen waste will be backyard composted to the extent possible.
• reusable materials and waste which could be reduced at source would be banned from Metro waste management facilities.
• Metro, Metro sponsored and Metro supported initiatives to restrict the collection and management of wastes which can be reduced or reused at source. Generators will be charged by container collected to reduce waste at source.
• deposits on beverage and other types of containers will significantly increase the quantity of materials reused and also effect the type of packaging used for other types of materials. It would effect (reduce) the quantity of materials recycled
• implementation of financial disincentives to discourage waste being generated (i.e., product disposal charges, packaging tax, waste management surcharge, etc.)
• plastic (soft drink), wax coated (milk and others) beverage containers replaced by returnable and reusable glass
• manufacture and use of more durable and hence longer life products rather than throw-away products (i.e., electric or reusable razor versus throwaways). Clothes and other textiles will be reused by others. Throw-away cameras and the like are banned or have a much higher cost.
• changes and reduction in product packaging (i.e., no packaging/bulk purchases, smaller, lighter or few layers of packaging, reusable packaging, use of single rather than multi-material packaging).
• product substitutions will have a significant effect on the quantity of waste generated. For example, the widespread use of washable cloth rather than disposal diapers and the use of more durable, reusable shopping bags rather than limited use or throw-aways.</td></tr>
</table>

APPENDIX G - CONTINUED

<table>
<tr><th rowspan="2">Waste Management Approach</th><th colspan="3">EXAMPLE OF TYPES OF WASTE MANAGED</th></tr>
<tr><th>Alternative No. 1</th><th>Alternative No. 2</th><th>Alternative No. 3</th></tr>
<tr><td rowspan="6">WASTE REDUCTION AND REUSE INITIATIVES AND PROGRAMS (Cont'd)</td><td colspan="3">• mandatory waste audits so that industry will implement reduction and reuse opportunities.</td></tr>
<tr><td colspan="3">• user charges to provide the incentive for the establishment of in-house industrial and commercial waste reduction and reuse programs that eliminate or significantly reduce waste by-products. This could be extended to include surcharges on excusive packaging, recyclable goods, etc.</td></tr>
<tr><td colspan="3">• reuse of books, magazines by others, or use in other countries.</td></tr>
<tr><td colspan="3">• consumers will reuse product packaging (i.e., yogart containers) for in-home storage containers.</td></tr>
<tr><td colspan="3">• repair and reuse of appliances, wood pallets, etc.</td></tr>
<tr><td colspan="3">• reuse of durable goods such as tire retreading.</td></tr>
</table>

APPENDIX G - CONTINUED

Waste Management Approach	EXAMPLE OF TYPES OF WASTE MANAGED		
	Alternative No. 1	Alternative No. 2	Alternative No. 3
WASTE RECYCLING PROGRAMS AND INITIATIVES	Waste recycling and reuse initiatives would manage 24 percent of total generated under alternative system targets Nos. 1 and 2. The following are examples of the type of waste that might be managed: • at source separation of newspapers, glass, metal and plastic. Blue box program would be expanded initially to include a larger service area (i.e., apartments, schools, etc.) and more types of waste (i.e., plastics, papers, cardboard), collection of white goods and other large appliances for recycle. Subsequently, recyclables would be collected as part of a wet/dry or three stream program. • mandatory recycling and increased public education would be used to increase participation and recovery rates • recyclable materials will be banned from landfill disposal • fine paper recycling at Metro office buildings, schools, etc. • dry wastes (cardboard, textiles, papers, metal, etc.) are collected separately and recovered for reuse and recycle. • implementation of recycling performance standards to ensure product specific recycling • high percentage of waste plastics are recyclable and most are recovered. • use of diversion credits or differential tipping fees to financially assist recycling of all types of recoverable materials • processing of drywall wastes to produce recyclable paper and gypsum. • recycling of rubber tires as rubber crumb for other uses. • reuse and recycling of certain demolition wastes such as bricks, concrete, lumber, etc. • recycling of tires, wood wastes for other uses, • standardization of glass container colours to facilitate recycling.		Waste recycling initiatives would manage 19 percent of total waste generated under Alternative No. 3. The lower percentage of recycled materials is due primarily to certain types of recyclable wastes directed to incineration. While this would include the lower grade or more difficult to separate materials, these would be recycled if additional incineration capacity did not compete for these materials.

<table>
<tr><th rowspan="2">Waste Management Approach</th><th colspan="3">EXAMPLE OF TYPES OF WASTE MANAGED</th></tr>
<tr><th>Alternative No. 1</th><th>Alternative No. 2</th><th>Alternative No. 3</th></tr>
<tr><td>COMPOSTING</td><td colspan="2">Composting would manage 14 percent of total waste generated as follows
• separate collection of leaf and yard wastes to centralized compost
• organic wastes from commercial sources such as food processors, public market scraps, and production wastage would be composted (ie. as proposed in the 190 TPD facility)
• residential separation of wet/organic wastes that are not composted at source would be collected separately for composting at one or more centralized facilities
• mixed organic wastes not source separated and contaminated organic residuals from other higher priority processes could be composted at a centralized facility with pre-processing capability if 14% of total waste generated could not be composted by the above methods.</td><td>Composting would manage 10 percent of the total waste generated as follows:
• leaf/yard waste as described in Alternative No. 1 and No. 2
• waste from commercial sources as described in Alternative Nos. 1 and 2
• source separated wet wastes as described in Alternative Nos. 1 and 2
Under Alternative No. 3, approximately 4% of total waste that is organic and combustible would be incinerated.</td></tr>
</table>

APPENDIX G - CONTINUED

	EXAMPLE OF TYPES OF WASTE MANAGED		
Waste Management Approach	**Alternative No. 1**	**Alternative No. 2**	**Alternative No. 3**
OTHER WASTES	Metro Toronto manages sewage sludge by incineration and some is disposed by landfill. Sewage sludge which is incinerated produces an ash which is landfilled. Dewatered sewage sludge and sewage sludge ash (from sludge incineration) would be diverted from disposal by landfill. This diversion would account for 3% of total waste generated. Sewage sludge now disposed by landfill would be incinerated. Uses for sewage sludge ash are being investigated. The use of tire and wood wastes for fuel substitution would account for 4 percent of total waste generated. The diversion of sewage sludge, tire and wood from landfill to their management by incineration would not meet Provincial diversion targets.		

APPENDIX G - CONTINUED

Waste Management Approach	EXAMPLE OF TYPES OF WASTE MANAGED		
	Alternative No. 1	Alternative No. 2	Alternative No. 3
ENERGY FROM WASTE	Waste would not be incinerated under Alternative No. 1	Only residual wastes from higher priority processes would be incinerated. 25% of total waste generated would be incinerated including the following types of combustible waste: • coated and laminated paper, plastic and wood products and non-recyclable plastics • mixed, residual contaminated fine materials (such as contaminated sawdust, food wastes, etc.) • contaminated, combustible recyclables (such as contaminated food, rags, contaminated cardboard, tissue, textiles, paper and plastic, used fast food containers, pizza boxes, etc.) • contaminated/dirty magazines, newspapers, and other types of unmarketable paper.	Waste incineration under this Alternative would be maximized. 34% of total waste generated would be burned. Of this, 9% of combustible waste that might have been managed by the 3Rs and composting would be directed to incineration. 34% of total waste generated would be burned. In addition to those types of waste noted under Alternative No. 2, the following additional types would be incinerated: • combustible, recyclables such as lower grades of mixed paper and plastic

APPENDIX G - CONTINUED

Waste Management Approach	EXAMPLE OF TYPES OF WASTE MANAGED		
	Alternative No. 1	Alternative No. 2	Alternative No. 3
LANDFILL - Mixed Waste - Residuals From Other Processes - Restricted Use Landfills	Some examples of the 42 percent of total waste that would be landfilled include:	17% of total waste generated would be landfilled under Alternative Nos. 2 and 3 including the following types of solid waste:	
	• non-recyclable wastes such as ceramics, old dirty textiles, disposable diapers, dirty paper and food/beverage containers, wrappings, etc.	• non-combustible, non-recyclable wastes	
	• non-recyclable glass such as light bulbs, mirrors, dishware, heat treated glass, etc.	• non-recyclable glass	
	• street sweepings, catchbasin wastes, water treatment plant sludges, (i.e., municipal wastes)	• these types of municipal wastes	
	• combustible waste that is not recyclable or compostable primarily because it is not marketable (i.e., it is dirty), used paper cups, paper towels, plastic coated cardboard, rags, textiles, etc.)		
	• broken, worn-out manufactured products such as mattresses, appliances, toys, furniture, etc.	• non-combustible, broken, worn out manufactured products	
	• unsortable fines, dirt, household vacuum sweepings, kitty litter, barber shop wastes, etc.	• fines and dirt	
	• clean fill, construction rubble, demolition debris, inerts	• clean fill, construction rubble, demolition debris, inerts	
	• unmarketable materials or processing residuals (perhaps compost produced from mixed waste)	• non-hazardous incinerator ash	
	• off-specification products not recyclable or usable.	• off-specification products	

APPENDIX H
Implementation Schedules for Alternatives

APPENDIX H

Implementation Schedules for three possible Alternative Systems discussed in Section 7.0, The Preliminary Master Plan.

The following tables (and explanations) are intended to show the interrelations and roles (%) and timing for implementation of the selected components for incorporation into three possible waste management systems to serve Metro:

Alternative 1 - As high a diversion as currently thought to be possible from landfill (54%) using recycling and composting without the use of EFW;

Alternative 2 - as high a diversion as possible from landfill (70%) with the use of recycling, composting at their maximum thought possible supported by a moderate use of EFW (16%);

Alternative 3 - a relatively high diversion as possible from landfill (68%) with moderate use of recycling and composting and a higher role for EFW (21%).

Figure H-1 - graphically illustrates these three Alternatives and the "percent" role for each type of facility in handling the total Metro solid waste stream.

Appendix H

Exhibit H - 1, Alternative 1

Implementation Schedule: High Diversion Alternative With No EFW

Year	Generated				Recycling						Composting					Other		Energy From Waste			Landfill		
	Trend	Reduced		Net Gen	Sorting Facilities			Banned, Privately Recycled	Total Metro		Compost Facilities			Total Metro		Including Recovered as Fuel		@1,200 TPD	Total Diverted		Residues from Other Facilities and Direct		Total to landfill
	Tonnes/Year (,000's	%		t/yr (,000's)	@500TPD Capacity No.	diverted	Other Prog				@500TPD Capacity No.	diverted	Other Prog					No.	t/yr (,000's)	%			
						tonnes per year (,000's)				%		tonnes/year (,000's)			%	(,000's)	%				t/yr	%	t/yr
1991	2,970	112	3.8%	2,858			104	225	330	11.5%	1*	53	62	115	3.9%	185	6.2%				2,228	75.0%	2,228
1992	3,027	151	5.0%	2,876	1	3	130	302	434	14.3%	1	87	67	154	5.1%	218	7.2%				2,071	68.4%	2,071
1993	3,086	192	6.2%	2,894	1	30	152	327	509	16.5%	2	139	69	208	6.7%	219	7.1%				1,959	63.5%	1,959
1994	3,146	233	7.4%	2,913	2	81	123	326	530	16.8%	2	229	70	299	9.5%	213	6.8%				1,872	59.5%	1,872
1995	3,207	275	8.6%	2,932	4	138	107	386	631	19.7%	3	343	72	415	13.0%	222	6.9%				1,664	51.9%	1,664
1996	3,269	319	9.7%	2,950	4	154	78	417	649	19.8%	4	370	74	444	13.6%	223	6.8%				1,634	50.0%	1,634
1997	3,332	363	10.9%	2,969	4	228	78	420	726	21.8%	4	372	76	449	13.5%	225	6.7%				1,569	47.1%	1,569
1998	3,396	409	12.0%	2,987	4	230	79	422	731	21.5%	4	375	78	453	13.3%	226	6.7%				1,577	46.5%	1,577
1999	3,461	455	13.2%	3,006	4	358	79	425	862	24.9%	4	377	81	457	13.2%	227	6.6%				1,459	42.1%	1,459
2000	3,527	503	14.3%	3,024	4	360	80	428	868	24.6%	4	379	82	461	13.1%	229	6.5%				1,467	41.6%	1,467
2001	3,594	552	15.3%	3,042	4	362	80	430	873	24.3%	4	382	82	464	12.9%	230	6.4%				1,476	41.1%	1,476
2002	3,650	600	16.4%	3,050	4	363	81	431	875	24.0%	4	383	83	465	12.7%	231	6.3%				1,479	40.5%	1,479
2003	3,707	648	17.5%	3,059	4	364	81	433	878	23.7%	4	384	83	466	12.6%	231	6.2%				1,483	40.0%	1,483
2004	3,764	698	18.5%	3,066	4	365	81	434	880	23.4%	4	384	83	467	12.4%	232	6.2%				1,487	39.5%	1,487
2005	3,822	748	19.6%	3,074	4	366	81	435	882	23.1%	4	385	83	469	12.3%	232	6.1%				1,491	39.0%	1,491
2006	3,881	800	20.6%	3,081	4	367	81	436	884	22.8%	4	386	83	470	12.1%	233	6.0%				1,494	38.5%	1,494
2007	3,942	852	21.6%	3,090	4	368	82	437	887	22.5%	4	387	84	471	12.0%	234	5.9%				1,499	38.0%	1,499
2008	4,002	905	22.6%	3,097	4	369	82	438	889	22.2%	4	388	84	472	11.8%	234	5.9%				1,502	37.5%	1,502
2009	4,064	959	23.6%	3,105	4	370	82	439	891	21.9%	4	389	84	473	11.6%	235	5.8%				1,506	37.1%	1,506
2010	4,127	1,014	24.6%	3,113	4	371	82	440	893	21.6%	4	390	84	475	11.5%	235	5.7%				1,510	36.6%	1,510

Cumulative Totals

T	70,974	10,787		60,187		5,246	1,823	8,030	15,099			6,584	1,564	8,148		4,514					32,427		32,427
%	100%	15%		85%		7%	3%	11%	21%			9%	2%	11%		6%					46%		46%

12/19/89

Proctor & Redfern

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Appendix H

Exhibit H - 2, Alternative 2

Implementation Schedule: High Diversion Alternative With EFW

Year	Generated				Recycling						Composting					Other		Energy From Waste			Landfill		
	Trend	Reduced		Net Gen	Sorting Facilities		Other	Banned, Privately Recycled	Total Metro		Compost Facilities		Other	Total Metro		Including Recovered as Fuel		@1,200 TPD	Total diverted		Residue from Other Facilities and Direct		Total to landfill
	Tonnes/Year			t/yr	@500TPD Capacity	diverted	Prog				@500TPD Capacity	diverted	Prog						t/yr				
		(,000's	%	(,000's)	No.	tonnes per year (,000's)				%	No.	tonnes/year (,000's)			%	(,000's)	%	No.	(,000's)	%		%	t/yr
1991	2,970	112	3.8%	2,858			104	225	330	11.5%	1*	53	62	115	3.9%	185	6.2%				2,228	75.0%	2,228
1992	3,027	151	5.0%	2,876	1	3	130	302	434	14.3%	1	87	67	154	5.1%	218	7.2%				2,071	68.4%	2,071
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1996	3,269	319	9.7%	2,950	4	154	78	417	649	19.8%	4	370	74	444	13.6%	223	6.8%	1	278	8.5%	1,356	41.5%	1,356
1997	3,332	363	10.9%	2,969	4	228	78	420	726	21.8%	4	372	76	449	13.5%	225	6.7%	1	278	8.4%	1,291	38.7%	1,291
1998	3,396	409	12.0%	2,987	4	230	79	422	731	21.5%	4	375	78	453	13.3%	226	6.7%	2	557	16.4%	1,021	30.1%	1,021
1999	3,461	455	13.2%	3,006	4	358	79	425	862	24.9%	4	377	81	457	13.2%	227	6.6%	3	835	24.1%	623	18.0%	623
2000	3,527	503	14.3%	3,024	4	360	80	428	868	24.6%	4	379	82	461	13.1%	229	6.5%	3	835	23.7%	632	17.9%	632
2001	3,594	552	15.3%	3,042	4	362	80	430	873	24.3%	4	382	82	464	12.9%	230	6.4%	3	835	23.2%	640	17.8%	640
2002	3,650	600	16.4%	3,050	4	363	81	431	875	24.0%	4	383	83	465	12.7%	231	6.3%	3	835	22.9%	644	17.7%	644
2003	3,707	648	17.5%	3,059	4	364	81	433	878	23.7%	4	384	83	466	12.6%	231	6.2%	3	835	22.5%	648	17.5%	648
2004	3,764	698	18.5%	3,066	4	365	81	434	880	23.4%	4	384	83	467	12.4%	232	6.2%	3	835	22.2%	652	17.3%	652
2005	3,822	748	19.6%	3,074	4	366	81	435	882	23.1%	4	385	83	469	12.3%	232	6.1%	3	835	21.9%	656	17.2%	656
2006	3,881	800	20.6%	3,081	4	367	81	436	884	22.8%	4	386	83	470	12.1%	233	6.0%	3	835	21.5%	659	17.0%	659
2007	3,942	852	21.6%	3,090	4	368	82	437	887	22.5%	4	387	84	471	12.0%	234	5.9%	3	835	21.2%	663	16.8%	663
2008	4,002	905	22.6%	3,097	4	369	82	438	889	22.2%	4	388	84	472	11.8%	234	5.9%	3	835	20.9%	667	16.7%	667
2009	4,064	959	23.6%	3,105	4	370	82	439	891	21.9%	4	389	84	473	11.6%	235	5.8%	3	835	20.6%	671	16.5%	671
2010	4,127	1,014	24.6%	3,113	4	371	82	440	893	21.6%	4	390	84	475	11.5%	235	5.7%	3	835	20.2%	675	16.3%	675
Cumulative Totals																							
T	70,974	10,787		60,187		5,246	1,823	8,030	15,099			6,584	1,564	8,148		4,514			11,136		21,291		21,291
%	100%	15%		85%		7%	3%	11%	21%			9%	2%	11%		6%			16%		30%		30%

* @ 200 TP

Appendix II

Exhibit II - 3, Alternative 3

Implementation Schedule: Moderate Diversion Alternative With EFW

Year	Generated				Recycling						Composting					Other		Energy From Waste			Landfill		
	Trend	Reduced		Net Gen	Blue Box Facilities @500TPD Capacity	diverted	Other Prog	Banned, Privately Recycled	Total Metro		Compost Facilities @500TPD Capacity	diverted	Other Prog	Total Metro		Including Recovered as Fuel		@1,200 TPD	Total Diverted		Residues from Other Facilities and Direct		Total to landfill
	Tonnes/Year	(,000's)	%	t/yr (,000's)	No.	tonnes per year (,000's)				%	No.	tonnes/year (,000's)			%	(,000's)	%	No.	t/yr (,000's)	%	t/yr	%	t/yr
1991	2,970	112	3.8%	2,858	1*	114	4	245	362	12.2%	1*	50	60	110	3.7%	206	6.9%				2,179	73.4%	2,179
1992	3,027	151	5.0%	2,876	2	139	6	288	434	14.3%	1	81	64	145	4.8%	208	6.9%				2,090	69.0%	2,090
1993	3,086	192	6.2%	2,894	2	150	6	312	468	15.2%	1	103	65	168	5.5%	209	6.8%				2,049	66.4%	2,049
1994	3,146	233	7.4%	2,913	2	160	4	336	500	15.9%	2	149	67	216	6.9%	210	6.7%				1,987	63.2%	1,987
1995	3,207	275	8.6%	2,932	2	170	4	360	535	16.7%	2	171	69	240	7.5%	212	6.6%				1,945	60.7%	1,945
1996	3,269	319	9.7%	2,950	2	205	4	385	594	18.2%	2	191	71	262	8.0%	213	6.5%	1	278	8.5%	1,602	49.0%	1,602
1997	3,332	363	10.9%	2,969	2	218	4	387	608	18.3%	2	207	73	280	8.4%	214	6.4%	2	557	16.7%	1,310	39.3%	1,310
1998	3,396	409	12.0%	2,987	3	229	4	408	641	18.9%	3	238	78	317	9.3%	226	6.7%	3	835	24.6%	968	28.5%	968
1999	3,461	455	13.2%	3,006	3	263	4	410	677	19.6%	3	240	81	320	9.3%	227	6.6%	4	1,114	32.2%	667	19.3%	667
2000	3,527	503	14.3%	3,024	3	264	4	413	681	19.3%	3	255	82	337	9.6%	229	6.5%	4	1,114	31.6%	664	18.8%	664
2001	3,594	552	15.3%	3,042	3	265	4	415	685	19.1%	3	257	82	339	9.4%	230	6.4%	4	1,114	31.0%	675	18.8%	675
2002	3,650	600	16.4%	3,050	3	266	4	416	687	18.8%	.	257	83	340	9.3%	231	6.3%	4	1,114	30.5%	680	18.6%	680
2003	3,707	648	17.5%	3,059	3	267	4	417	688	18.6%	3	258	83	341	9.2%	231	6.2%	4	1,114	30.0%	684	18.5%	684
2004	3,764	698	18.5%	3,066	3	267	4	418	690	18.3%	3	259	83	342	9.1%	232	6.2%	4	1,114	29.6%	689	18.3%	689
2005	3,822	748	19.6%	3,074	3	268	4	420	692	18.1%	3	259	83	343	9.0%	232	6.1%	4	1,114	29.1%	693	18.1%	693
2006	3,881	800	20.6%	3,081	3	269	4	421	693	17.9%	3	260	83	343	8.8%	233	6.0%	4	1,114	28.7%	698	18.0%	698
2007	3,942	852	21.6%	3,090	3	269	4	422	695	17.6%	3	261	84	344	8.7%	234	5.9%	4	1,114	28.2%	703	17.8%	703
2008	4,002	905	22.6%	3,097	3	270	4	423	697	17.4%	3	261	84	345	8.6%	234	5.9%	4	1,114	27.8%	707	17.7%	707
2009	4,064	959	23.6%	3,105	3	271	4	424	699	17.2%	3	262	84	346	8.5%	235	5.8%	4	1,114	27.4%	712	17.5%	712
2010	4,127	1,014	24.6%	3,113	3	271	4	425	701	17.0%	3	263	84	347	8.4%	235	5.7%	4	1,114	27.0%	716	17.4%	716
Cumulative Totals					*@200TPD																		
T	70,974	10,787		60,187		4,594	88	7,744	12,427			4,283	1,542	5,825		4,482			15,034		22,419		22,419
%	100%	15%		85%		6%	0%	11%	18%			6%	2%	8%		6%			21%		32%		32%

APPENDIX H - CONTINUED

Column Descriptions
Alternative 1 & 2

Year	
	Study period 40 years; first 21 years only shown
Generated	
Trend	Based on projections of population and employment growth provided by Metro; waste generation per capita taken to grow at historical rate of 1.29% per year, compounded.
Reduced	Difference between trend and net generated. Includes source reduction and reuse.
Net Gen	based on projections of population and employment growth provided by Metro; waste generation per capita taken to remain unchanged from 1988 levels
Recycling	
Sorting Facilities @ 500 TPD	
No.	Number of plants expected in operation by end of year. Number of plants is calculated on basis of annual capacity required, assuming nominal 250 days per year at rated nominal capacity. Plants are assumed to be able to operate up to 20% above rated capacity. If additional capacity is then required another plant is added.
TPD	aggregate daily input capacity of plants
Diverted, Tonnes	waste diverted based on 250 days of operation per year sorting efficiency assumed to be: 1991 - 1996 27% 1997 - 1998 40% 1999 - 2011 60%
By Other Prog Tonnes	includes remaining Blue Box program in years 1991 to 1995 also includes white goods collection, separate newspaper collection
Banned, Privately Recycled, Tonne	Predominantly materials banned from landfill and recycled by commercial and industrial generators due to high tipping fee incentive.
Total Metro Tonnes, %	tonnes represent sum of amounts diverted from previous three columns; percent is based on trend quantity column

Column Descriptions
Alternative 1 & 2

Composting

Compost Facilities @ 500 TPD (pilot plant @ 200TPD in 1991)

No.	Number of plants expected in operation by end of year. Number of plants is calculated on basis of annual capacity required, assuming nominal 250 days per year at rated nominal capacity. Plants are assumed to be able to operate up to 20% above rated capacity. If additional capacity is then required another plant is added.
TPD	aggregate daily input capacity of plants
Diverted, Tonnes	waste diverted based on 250 days of operation per year residues from composting assumed to be 25% of input
By Other Prog Tonnes	includes back yard composting, separate leaf and christmas tree composting and chipping, some private diversion to composting
Total Metro Tonnes, %	tonnes represent sum of amounts diverted from previous three columns; percent is based on trend quantity column

Other

Including Recovered As Fuel

Tonnes %	Includes diversion of sewage sludge, some tire and wood waste as fuel. This diversion is not accepted as part of the MOE goal of 50% by the 3R's by the year 2000

Energy From Waste

@ 1200 TPD capacity

No.	Number of plants expected in operation by end of year. Number of plants is calculated on basis of annual capacity required, assuming nominal 290 days per year at rated nominal input capacity of 1220TPD. Plants are assumed to be operated at their nominal annual capacity.
TPD	aggregate daily input capacity of plants
Total Diverted Tonnes %	Net amount diverted assuming ash at 20% of input. This diversion is not accepted as part of MOE goal of 50% by the 3R's by the year 2000.

Column Descriptions
Alternative 1 & 2

Landfill

Residues from Other Facilities and Direct

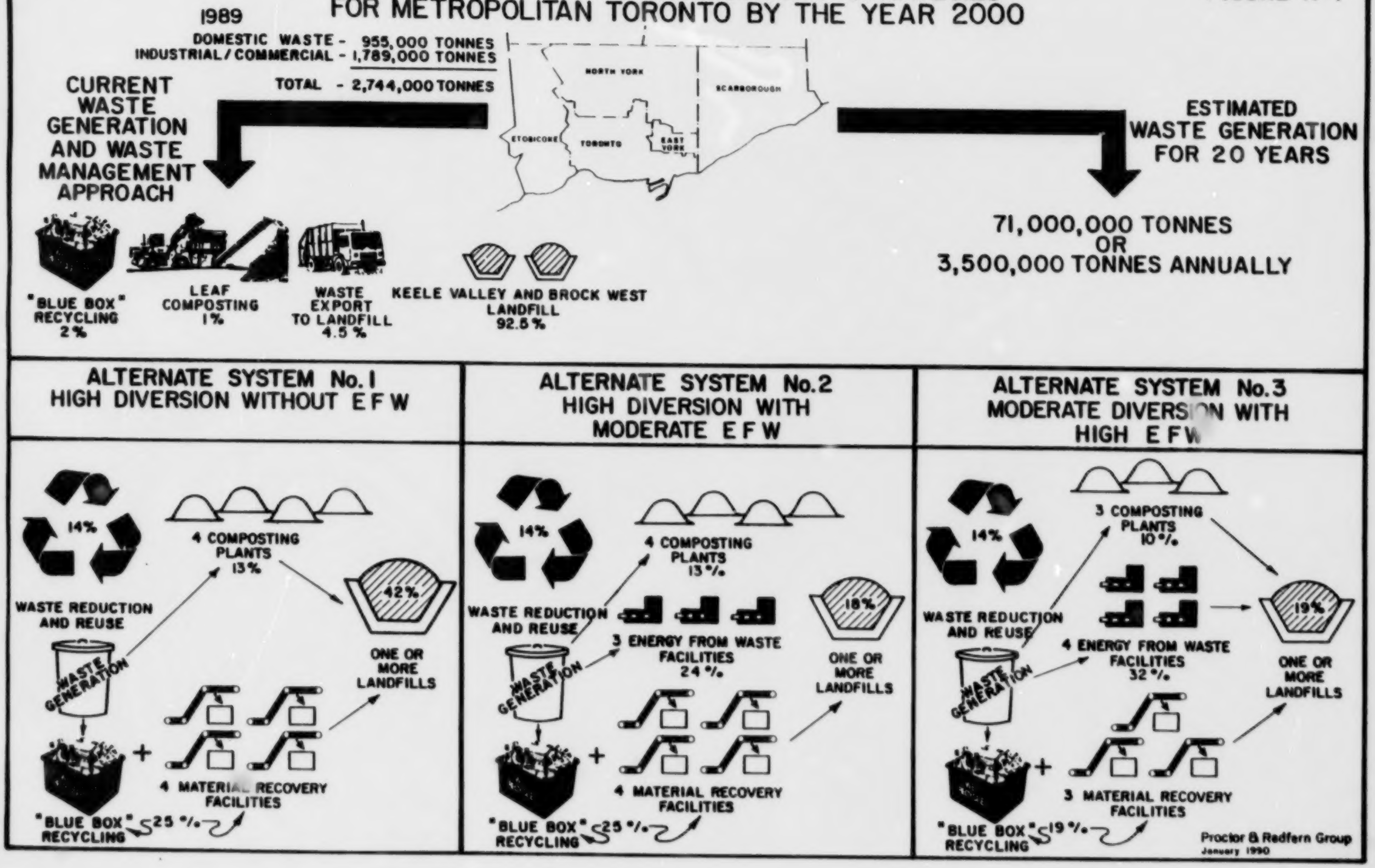
tonnes **%**	includes non-recyclable/non-combustible material, ash, residue from sorting plants and composting etc.

York & Durham Residue

tonnes	Material accepted from the Regions under agreement. Assumed to be 'post recycling' quantities. Amounts are estimated, and not directly under Metro control.
Total to Landfill	Sum of Metro and Regions Landfill use.

FIGURE H-1

ALTERNATIVE WASTE MANAGEMENT STRATEGIES FOR METROPOLITAN TORONTO BY THE YEAR 2000


1989
DOMESTIC WASTE - 955,000 TONNES
INDUSTRIAL / COMMERCIAL - 1,789,000 TONNES
TOTAL - 2,744,000 TONNES
NORTH YORK
SCARBOROUGH
ETOBICOKE
TORONTO
EAST YORK
CURRENT WASTE GENERATION AND WASTE MANAGEMENT APPROACH
"BLUE BOX" RECYCLING 2%
LEAF COMPOSTING 1%
WASTE EXPORT TO LANDFILL 4.5 %
KEELE VALLEY AND BROCK WEST LANDFILL 92.5 %
ESTIMATED WASTE GENERATION FOR 20 YEARS
71,000,000 TONNES OR 3,500,000 TONNES ANNUALLY
ALTERNATE SYSTEM No. 1
HIGH DIVERSION WITHOUT E F W
14%
WASTE REDUCTION AND REUSE
WASTE GENERATION
4 COMPOSTING PLANTS 13%
42%
ONE OR MORE LANDFILLS
4 MATERIAL RECOVERY FACILITIES
"BLUE BOX" RECYCLING 25 %
ALTERNATE SYSTEM No. 2
HIGH DIVERSION WITH MODERATE E F W
14%
WASTE REDUCTION AND REUSE
WASTE GENERATION
4 COMPOSTING PLANTS 13 %
3 ENERGY FROM WASTE FACILITIES 24 %
18%
ONE OR MORE LANDFILLS
4 MATERIAL RECOVERY FACILITIES
"BLUE BOX" RECYCLING 25 %
ALTERNATE SYSTEM No. 3
MODERATE DIVERSION WITH HIGH E F W
14%
WASTE REDUCTION AND REUSE
WASTE GENERATION
3 COMPOSTING PLANTS 10 %
4 ENERGY FROM WASTE FACILITIES 32 %
19%
ONE OR MORE LANDFILLS
3 MATERIAL RECOVERY FACILITIES
"BLUE BOX" RECYCLING 19 %

Proctor & Redfern Group
January 1990

APPENDIX I

Glossary of Solid Waste Management Terms

GLOSSARY OF WASTE MANAGEMENT TERMS

COMPILED BY PROCTOR & REDFERN
(NOVEMBER 1989)

GLOSSARY OF TERMS - ABBREVIATIONS

B.

BOD	-	Biochemical Oxygen Demand
BTU	-	British Thermal Unit

C.

CFC	-	Chlorofluorocarbon
CHA	-	Consolidated Hearings Act
COD	-	Chemical Oxygen Demand
C of A	-	Certificate of Approval
CV	-	Calorific Value

D.

dBA	-	Decibel Frequency Weighting
DH	-	District Heating
DO	-	Dissolved Oxygen

E.

EAA	-	Environmental Assessment Act
EA Branch	-	Environmental Assessment Branch of MOE
EAB	-	Environmental Assessment Board
EFW	-	Energy From Waste
EPA	-	Environmental Protection Act
EPA	-	Environmental Protection Agency (USA)
ESP	-	Electrostatic Precipitator

G.

GJ	-	Gigajoule
GW	-	Gigawatt

H.

ha	-	Hectare

K.

kcal	-	Kilocalorie
kJ	-	Kilojoule
kWh	-	Kilowatt Hour
kW	-	Kilowatt

M.

MOE	-	Ministry of the Environment
MNR	-	Ministry of Natural Resources
MSW	-	Municipal Solid Waste
MW	-	Megawatt

O.

OMB	-	Ontario Municipal Board
OP	-	Official Plan
OPA	-	Official Plan Amendment
OW	-	Observation or Monitoring Well
OWMC	-	Ontario Waste Management Corporation
OWRA	-	Ontario Water Resources Act

P.

PET	-	Polyethylene Terephthalate
ppm	-	Parts per Million
ppb	-	Parts per Billion
ppt	-	Parts per Trillion
PSC	-	Pre-Submission Consultation

P. - Cont'd

PW	-	Pumping Well
PVC	-	Polyvinyl Chloride

R.

R&D	-	Research and Development
RDF	-	Refuse Derived Fuel
Reg. 308	-	Ontario Regulation 308 (Air) to the Environmental Protection Act
Reg. 309	-	Ontario Regulation 309 to the Environmental Protection Act
The Reviewers	-	Refers to provincial ministries and other governmental agencies that review an EA

T.

TPD	-	Tonnes per Day
TPH	-	Tonnes per Hour
TPY	-	Tonnes per Year

W.

WDF	-	Waste Derived Fuel
WTE	-	Waste to Energy

Z.

ZBL	-	Zoning By-Law
ZBLA	-	Zoning By-Law Amendment

GLOSSARY OF WASTE MANAGEMENT TERMS

The following provides a description of some of the terms that are used in this report. It has been assembled by Proctor & Redfern and used in several of their studies. This glossary has been compiled from many sources. Where available, Ontario statutory definitions or Ontario Ministry of the Environment descriptions have been used. Reference should be made to Ontario Regulation 309 to the Environmental Protection Act for more complete definition and description of waste types and systems.

"A"

Abatement - The reduction in degree or intensity of pollution (MOE).

Abrasion - the wearing away of surface material by the scouring action of moving solids, liquids or gases.

Absolute or Primary Constraints - the presence of these types of constraints would eliminate areas from further consideration for the establishment of a waste management facility. These types of constraints are considered in the first consideration of the site selection planning process. The application of mitigative measures is usually not possible or practical. Also referred to as Primary Constraints.

Absorption - the penetration of one substance into or through another.

Access road - a roadway available to the public which provides access between a public-owned roadway and the entrance to a waste receiving facility.

- roads that will be traveled by vehicles carrying waste to and from a waste management facility. Preferred or primary access roads are used in the process of site selection and site design as the route from major highways to the facility site.

Adjacent property - the land bordering the waste disposal site and the containment attentuation zone (MOE).

Activated Carbon - a highly absorbent form of carbon used to remove odours and toxic substances from gaseous emissions or remove dissolved organic material from wastewater.

Acute Exposure - exposure of short duration.

Acute Toxicity - any poisonous effect produced within a short period, usually up to 24 - 96 hours, resulting in severe biological harm and often death (MOE).

Adsorption - molecular attraction which holds the surfaces of two substances in contact, such as water and rock particles.

Advection - a physical process whereby contaminants introduced to an environment migrate in solutions (as solutes) in the direction of groundwater flow.

Aeration - the process of exposing something to air or charging a liquid with gas.

Aerobic - the biological state of living and growing in the presence of oxygen.
- requiring the presents of free oxygen.

Aerodrome - any area of land or water (including the frozen surface thereof) or other supporting surface used or designed, prepared, equipped or set apart for use either in whole or in part for the arrival or departure, movement or servicing of aircraft and including any building, installation and equipment in connection therewith.

Aerosol - a particle of solid or liquid matter that can remain suspended in the air because of its small size.

Afterburner - a device that includes an auxiliary fuel burner and combustion chamber to incinerate combustible gas contaminants.

Aggregate - crushed rock or gravel screened to sizes for use in road surfaces, construction fill, concrete or bituminous mixes.

Agricultural Waste - waste that results from farm operations and which is disposed in accordance with normal farming practices and/or at municipal waste management facilities. It does not include liquid waste or hazardous waste.

- means waste, other than sewage, resulting from farm operations, including animal husbandry and where a farm operation is carried on in respect of food packing, food preserving, animal slaughtering or meat packing, includes the waste from such operations (Ontario Reg. 309).

Air Classifier - a system that uses a forced air stream to separate mixed material according to size, density and aerodynamic drag of the pieces. Air classification is a front end resource recovery or incineration process that is usually preceded by a waste shredder.

Air Emissions - for stationary sources, the release or discharge of a pollutant from a facility or operation into the ambient air either by means of a stack or as a fugitive dust, mist or vapour.

Air Pollutant - dust, fumes, smoke and other particulate matter, vapour, gas, odourous substances or any combination thereof. Also any air pollution agent or combination of such agents, including any physical, chemical, biological, radioactive substances or matter which is emitted into or otherwise enters the ambient air.

Air Pollution - the presence of any air pollutant in sufficient quantities as to interfere with the enjoyment of life or property (MOE).

Air Pollution Episode - means an occasion where air contamination is at such a level and for such a period of time that the air contamination may become the cause of increased human sickness and mortality (Ontario Reg. 308).

Air Pollution Index - means a series of numbers expressing the relative levels of air pollution and taking into consideration one or more air contaminants (Ontario Reg. 308).

Airport - a private or public licensed aerodrome.

Airshed - air space in which emissions from a facility are dispersed.

Alternative Waste Management Technologies and Processes - these include, but are not limited to: reduction of waste generation; source separation; mechanized material separation; transfer stations; shredding; refuse derived fuel (RDF); incineration; energy from waste (EFW); composting; landfilling; waste import/export; and null alternative (MOE).

Ambient - of the surrounding environment.

Ambient Air - that portion of the atmosphere external to buildings to which the general public has access.

Anaerobic - the biological state of living and growing in the absence of oxygen.
- not requiring the presence of free oxygen.

Anion - a negatively charged ion.

Anistropic - material which does not have the same physical properties in all directions. Often used in a hydrogeological evaluation to consider the capability of soil for landfill. (Also see isotropic)

Approaches to - in the context of the Environmental Assessment Act, refers to generic types of waste management rather than specific methods of. (See Alternative Technologies).

Aquifer - a geologic formation that is capable of yielding usable (potable) quantities of groundwater to wells or springs. Movement is principally in a horizontal direction through porous underground strata.

- a saturated permeable geologic formation that stores groundwater and is capable of yielding significant quantities of groundwater to wells and springs.

Areas of Natural and Scientific Interest (ANSI) - ANSIs are areas of land and water containing natural landscapes or features which have been identified as having values related to protection, natural heritage, scientific study or education (from Ministry of Natural Resources).

Asbestos Waste - means solid or liquid waste that results from the removal of asbestos - containing construction or insulation materials or the manufacture of asbestos-containing products and contains asbestos in more than a trivial amount of proportion (Ontario Reg. 309).

Ash - inorganic residue remaining after the ignition of combustible substances and can contain bottom ash and/or fly ash.

Assimilative Capacity - a measure of the ability of a receiving body (eg. river, lake, etc.) to render innocuous, those substances deposited in it such that the quality of the receiving body does not degrade below a predetermined level.

Attenuation - describes a number of chemical and biochemical processes that retard chemical movement along a groundwater flow path and reduce chemical concentrations of a contaminant.

Autogenous Combustion - the burning of wet organic material where the moisture content is at such a level that the heat of combustion of the organic material is sufficient to vaporize the water and maintain combustion; no auxiliary fuel is required except for start-up. Also described as autothermic combustion.

Available Waste - that portion of the processable waste stream which could potentially be received at a waste management facility or diverted from landfill by a waste management program. It does not include liquid waste or hazardous waste.

"B"

Back-end Process - generally refers to those methods of waste management which are normally undertaken following front-end preparation of waste. Back-end process is typically directed at separating the organic portion of the waste stream.

Backfilling Waste - waste material generated primarily from excavations and construction and considered relatively inert.

Background Level - amounts of pollutants present in the environment prior to the establishment, start-up and operation of a facility.

Baghouse - an air pollution abatement device used to trap particulates by filtering gas streams through large fabric bags usually made of cloth or glass fibres.

Balefill Site - a solid waste disposal site in which waste is compacted into bales before it is placed into the landfill. Compaction of waste is therefore not required.

Baler - a machine used to compress and bind solid waste or other materials (i.e. paper, metal, etc.) to facilitate transportation, storage or disposal.

Batch-Fed Incinerator - an incinerator that is periodically charged with waste. One charge is allowed to burn out before another is added.

Bedrock - the solid rock underlying soils and subsoils or exposed rock at the surface. Examples are limestone, dolostone and shale.

Beneficiation - the concentration, enhancement or upgrading of waste materials in a resource recovery processing system so that they may be more readily used as secondary materials.

Benthos - bottom dwelling forms of marine life.

Berm - an artificial ridge of earth or other material.

- an earth barrier used as a mitigative measure against visual and/or noise effects or to contain spills.

Bioaccumulative - a characteristic of a chemical species when the rate of intake into a living organism is greater than the rate of excretion or metabolism. This results in an increase in tissue concentration relative to the exposure concentration.

Bioassay - a determination of the concentration or dose of a given material necessary to affect a test organism under stated conditions.

- an assay method using changes in the biological activity of living organisms such as fish as a qualitative or quantitative measure of a material's effect on other living organisms.

Biochemical Oxygen Demand (BOD) - a measure of the amount of oxygen used in the biochemical oxidation of organic matter in water over a specified time under specified conditions. BOD_5 is the BOD measured in a 5-day test. It is a standard test used in assessing wastewater strength.

Biodegradable - the ability of a substance to be broken down physically and/or chemically by micro-organisms.

Biomass - the amount of living matter in a given unit of the environment.

Biota - the combined fauna and flora of any geographical area or geological period.

Blowdown - the minimum discharge of recirculating water for the purpose of discharging materials contained in the process, the further buildup of which would cause concentrations or amounts exceeding limits established by best engineering practice.

Blue Box System - often used to describe a curbside multi-material recycling program.

Bore Hole - a man-made hole in a geological formation which has been drilled, jetted, driven, or made by other similar techniques. It is used to determine soil and roc characteristics and also permits the installation of a water well or an observation well for groundwater monitoring purposes.

Borrow Area - an area located on or off-site from which material is extracted for use in landfill construction (i.e. clay pad construction, berms, etc.) and/or operations (i.e. daily, final cover).

Bottom Ash - the solid material that remains on a hearth or falls off the grate after thermal processing is complete.

Breaching - a passage that conducts the products of combustion to a stack or chimney.

British Thermal Unit (BTU) - the amount of heat required to raise the temperature of one pound of water one degree fahrenheit.

Buffer - in a land use context, a buffer can be:

1. a space; or
2. a feature; or
3. a land use; or
4. any combination of the above,

interposed between two conflicting land uses for the purpose of reducing or eliminating the adverse effects of one land use upon the other. A buffer may be open space, where distance alone is relied upon to produce the desired results, or it may be a berm, wall, trench, fence, or other structure or plantings, or other land use different from the two conflicting ones, but compatible with both (MOE).

Buffer Area - the area between an emission source(s) and nearby sensitive land uses, where land use controls are used to minimize any significant adverse effects. It can be of variable size, shape and composition to produce the desired results and apply to all or part of an Influence Area (MOE).

- the intent is to provide a peripheral area around the fill area, within the boundaries of the site, that is to be used for the maintenance and management of the site and equipment, and also provide room to implement corrective measures for the collection and treatment of contaminants (MOE).

A minimum of 30 metres of on-site buffer area around the fill area should be provided for all sites. This should be sufficient for:

1) general operation and maintenance controls,
2) leachate and gas control measures,
3) any visual barriers required,
4) noise, odour and dust controls.
(MOE)

Bulky Waste - large items of refuse, including but not limited to appliances, furniture, large auto parts, trees, branches and stumps which cannot be handled by normal solid waste processing, collection or disposal methods (MOE).

Bunker "C" Oil - a general term used to indicate a heavy, viscous fuel oil.

Burning Area - the horizontal projection of a grate, a hearth, or both.

Burning Rate - the volume of solid waste incinerated or the amount of heat released during incineration. The burning rate is usually expressed in pounds of solid waste per square foot of burning area per hour or in British Thermal Units per cubic foot of furnace volume per hour (MOE).

"C"

Cake - the solids discharged from a dewatering operation.

Calcination - the process of heating a waste material to a high temperature without fusing in order to effect useful change (i.e. oxidation, pulverization).

Candidate Nature Reserve - sites selected on a systematic basis to represent the natural features and landscapes of Ontario and to complement other protected zones in the provincial parks system (from Ministry of Natural Resources).

Capability - a capacity for being used or developed. Often used in the context of hydrogeology to determine a site's potential without reference to other considerations. Also see "Suitability".

Capacity - the upper limit to which an area of land or water may be used or developed without an undesirable change taking place in the environment. Also call Carrying Capacity (from Ministry of Natural Resources).

Capital Costs - expenditures incurred for the purchase or construction of materials and facilities that will have a useful life in excess of one year.

Carbonaceous Matter - pure carbon or carbon compounds present in the fuel or residue of a combustion process.

Carbon Sorption - the process in which a substance (the sorbate) is brought into contact with a solid (the sorbent), usually activated carbon, and held there either by chemical or physical means.

Carcinogenic - capable of causing the cells of an organism to react in such a way as to produce cancer.

Carrier - means any person or corporation who, by virtue of ownership, management, control or operation, is engaged in the transportation of waste (MOE).

Carrying Capacity - the level of use that can be accommodated and continued without irreversible damage to natural or human resources, the ecosystem, and the quality of air, land and water.

Cation - a positively charged ion.

Centroid of Waste Generation - a mathematical description which identifies the equilibrium point of waste generation within a defined area on the basis of distance, population and annual quantity of waste generated.

Cell - in respect to a landfill site, means a deposit of waste that has been sealed by cover material so that no waste deposited in the cell is exposed to the atmosphere (Ontario Reg. 309).

Certificate of Approval - with respect to a waste disposal site, it is issued under Part V of the Environmental Protection Act, and provides conditional permission to operate a waste disposal site. A certificate of approval is required before a waste disposal management system or a waste disposal site or facility can be used, operated, established, altered, enlarged or extended.

Chamber - an enclosed space inside an incinerator.

Charge - the amount of solid waste introduced into a furnace at one time, or in the steel industry, the addition of iron and scrap metal or other materials into the top of an electric arc furnace.

Charging Chute - an overhead passage through which waste materials drop into an incinerator.

Chemical Oxygen Demand (COD) - is the measure of the amount of oxygen required for the chemical oxidation of organic matter in a liquid.

Chronic Exposure - exposure of long-term duration.

Classification - the separation and/or rearrangement of waste materials according to composition (i.e. organic or inorganic), size, weight, colour, shape and the like, using specialized equipment.

Clinker - hard, sintered or fused particles of residue formed in a furnace by the agglomeration of ash, metals, glass and ceramics.

Codisposal - the technique in which sludge is combined with other combustible materials (eg. refuse, refuse-derived fuel, coal) to form a furnace feed with a higher heating value than original sludge (MOE).

Co-generation - the production of usable energy in more than one form from a single facility in order to improve efficiency or market suitability. An example is the production of steam heat and electrical power from an energy from waste or nuclear power plant.

Cold Water Fishery - a fresh water, mixed fish population, including some salmonids.

Collection - the act of picking up refuse at the home, business or industrial site on a door-to-door basis.

Combustibles - materials that can be ignited at a specific temperature in the presence of air to release heat energy (MOE).

Combustible Waste - that portion of total waste considered suitable, with or without preprocessing for diversion to an incineration or energy from waste facility and which can be ignited at a specific temperature in the presence of air to release heat energy.

Combustion - the production of heat and light energy through a chemical process, usually oxidation.

Combustion Gases - the mixture of gases and vapours produced by burning.

Commercial Waste - solid non-hazardous waste that is generated from commercial establishments. Collection of these wastes may be the responsibility of the municipality. Commercial waste is considered generally putrescible by nature. It does not include liquid waste or hazardous waste.

- all types of solid wastes generated by stores, offices, restaurants, warehouses, and other non-manufacturing activities, excluding residential and industrial wastes (MOE).

Compaction - reduction in bulk of fill by rolling, tamping, or other mechanical means.

Compatible Land Uses (Landfill) - land uses or activities generally considered compatible with an operating disposal (landfill) site include: above-grade transportation routes and utilities, fences, farming activities, scrap yards, incinerators, gravel pit and quarry operations, or any other use where the activity or enjoyment thereof would not be impaired by nuisance effects (MOE).

Compost - a relatively stable mixture of decomposed organic waste materials, generally used to condition and fertilize soil.

Composting - an aerobic process involving the biological stabilization of sludge by microorganisms. Generally comprises spreading or windrowing the waste which is sometimes mixed with a bulking agent to maximize air contact,

- means the treatment of waste by aerobic decomposition of organic matter by bacterial action for the production of stabilized humus (Ontario Reg. 309).

Concentration - the relative fraction of one substance in another, normally expressed in weight percent, volume percent or as weight/volumes.

Conceptual - a generalized idea of a class of objects.

Conduction - the transfer of heat by physical contact between two substances.

Constraint - a bound or confine imposed as a restriction on some activity.

Construction and Demolition Waste - means wastes resulting from construction, remodeling, repair and demolition of structures, road buildings and land clearing. Such wastes include bricks, concrete and other masonry materials, soil, rock, lumber, road spoils, paving material, tree and brush stumps.

- rubble resulting from construction, remodeling, repair, and demolition operations on houses, commercial buildings and other structures and pavements (MOE).

Containment Well - a pumping well installed for the purpose of controlling the movement of contaminated water.

Contaminant - any physical, chemical, biological or radiological substance or matter in water.

- a pollutant; an impurity.

Contaminant Attenuation Zone - the zone beneath the surface, on the portion of the leachate buffer area located beyond the waste disposal site boundary, where contaminants will be naturally attenuated (MOE).

Contingency Plan - an organized, planned and coordinated course of action to follow in case of any unexpected failure in the design of a waste management facility. A contingency plan is considered to be a backup measure only and proposed measures with a high level of probability of implementation are not contingency plans.

Continuous Sampling - the collection of cores of soil (overburden) during the drilling of a borehole. A continuous soil sample is collected from the surface to the bottom of the hole.

Controlled Air Incinerator - an incinerator with two or more combustion chambers in which the amounts and distribution of air are controlled. Partial combustion takes place in the first zone and gases are burned in a subsequent zone or zones.

Corrosion - the gradual wearing away of a substance by chemical action. Usually has a very high or very low pH value.

Covenant - an agreement written into deeds and other instruments promising performance or non-performance of certain acts or stipulating certain uses or non uses of property.

Cover Material - means soil or other suitable material approved by the Director, used for covering waste in a landfill operation and for sealing cells (MOE).

Crown Land - all land (including land under water) held by the province (and federal government), both land which has never been sold and land which has been re-acquired (from Ministry of Natural Resources).

Cullet - broken or refuse glass usually added to new material to facilitate melting in making glass.

Curie - a measure of radioactivity.

Curtain Wall - a refractory construction or baffle that deflects combustion gases downward.

Cyclone Separator - a separator that uses a swirling air flow to sort mixed materials according to size, weight and density.

"D"

Damper - a manually or automatically controlled device to regulate draft or the rate of flow of air or other gases.

dBA - formula used for measuring sound pressure level (intensity). dB stands for decibel, a dimensionless measure of sound pressure level. "A" weighting is the frequency weighting characteristics intended to approximate the relative sensitivity of the normal ear to different frequencies (pitches) of sound.

Decibel - a unit of sound measurement.

Decommission - means the closing down of waste management, industrial or other types of facilities in an environmentally acceptable way (MOE).

Decompose - separate into its elements.

Deep-Well Injection - disposal of raw or untreated hazardous wastes by pumping them into deep wells for filtration through porous or permeable subsurface rock and then containment within surrounding layers of impermeable rock or clay.

Degradation - the lowering of the quality or value of a substance or object, usually air or water quality.

Density - the ratio of the mass of a substance to its volume.

Detoxification - removal of poisonous substances.

Dewatering - a physical process which removes sufficient water from sludge so that its physical form is changed from that of a fluid to that of a slurry or damp solid.

Diffusion - migration of molecules or ions as a result of their own random movements from a region of higher to a region of lower concentration.

Dilution - increasing the proportion of solvent to solute in any solution and thereby decreasing the concentration of solute per unit volume.

Dispersion Technique - the use of dilution to attain ambient air quality levels including any intermittent or supplemental control of air pollutants varying with atmospheric conditions.

Dioxins - a short collective term for a group of 73 chemically similar substances. The most toxic of these is 2, 3, 7, 8 - tetra chlorodibenzoparadioxin (TCDD). All dioxins contain chlorine.

Dispersion - Air - dilution of gases or particles in the atmosphere.
Soil - dilution of substances dissolved in ground water (solutes) in the porous media through which they flow. The solutes tend to spread out from the path they would be expected to follow based only on the ground water flow and velocity. This spreading phenomenon is known as hydro-dynamic dispersion. It occurs because of mechanical mixing during flow through soil pores and because of molecular diffusion.

Disposal - means the discharge, deposit, injection, dumping, filling or placing of solid waste into or on any land or water (MOE).

- the planned release or placement of waste in a manner that precludes recovery (MOE).

Disposal Facility - a collection of equipment and associated land area which serves to receive waste and dispose of it. The facility may have available one, many, or all of a large number of disposal methods (MOE).

Dissolved Oxygen (DO) - the quantity of oxygen dissolved in a certain volume of water.

Dissolved Solids - the anhydrous residues of the dissolved constituents in water.

Diversion Credits - a cash allowance that is paid, usually on a per tonne basis, for waste that is diverted from disposal by landfill. Normally, calculated as a percentage of the tipping fee or disposal cost.

Domestic Waste - is solid non-hazardous waste generated from households. Also referred to as residential waste or municipal solid waste (MSW). Collection of these wastes is the responsibility of the municipality. It does not include liquid waste or hazardous waste.

Domestic Well - a water well used for private household or farm supplies.

Dose-Response Assessment - describes the relationship between the amount of a chemical taken up by the body and the incidence or seriousness of the injury. This includes extrapolation from animals to people and from the high concentrations used in an experiment to the trace amounts likely to be found in the environment.

Draft - the difference between the pressure within an incinerator and that in the atmosphere.

Dry Separation - the separation of residential solid waste at source of several waste components from the "wet" or organic fraction. Dry wastes typically include paper, packaging, glass, metal, etc. These dry wastes are then further separated/processed at a central facility for reuse and recycling. Also see wet separation.

Dump - a waste disposal site where waste is disposed in a manner that does not protect the environment. Dumping is the indiscriminate land disposal of waste.

- a waste disposal site where waste is deposited without cover material being applied at regular intervals (Ontario Reg. 309).

Duct - a conduit, usually metal or fibreglass, round or rectangular in cross section, used for conveyance of air.

Dust - fine grain particles light enough to be suspended in air.

Dust Suppressant - means a waste used for dust suppression in accordance with a certificate of approval or provisional certificate of approval for a dust suppression waste management system (Ontario Reg. 309).

"E"

Earth Science Feature - public or private land where landforms of provincial interest have been identified (from Ministry of Natural Resources).

Easement - a right granted by the owner of land to another party for specific limited use of the land.

Ecology - the science that deals with the study of the interrelationships of living organisms to their environment.

Economics - deals with the comparative worth of project alternatives and its ability to generate benefits relative to costs.

Effect - the positive and negative consequences of a proposed undertaking.

Effluent - waste materials, usually waterborne, discharged to the environment, treated or untreated.

- liquid waste material discharged from an industrial or other production or treatment process.

Electrostatic Precipitator (ESP) - an air pollution control device that imparts an electric charge to particles in a gas stream (i.e. dust, mist and fume) causing them to collect on an electrode.

- a device used in flue gas treatment to collect particulate matter from the flue gas by means of electric forces.

Emissions - pollutants in the form of gases or fine particles released into the atmosphere, usually from a stack.

Emission Rate - the amount of pollutant emitted per unit of time (MOE).

Emulsion - liquid mixture with particles suspended in it.

Encapsulation - the complete enclosure of a waste in another material in such a way as to isolate it from external effects such as water or air.

Energy-from-Waste (EFW) - the production of energy in the form of steam, electricity or hot water from incinerating solid wastes either in bulk or in a shredded and classified form (refuse derived fuel - RDF). Also referred to as waste to energy.

Energy Recovery - associated with the burning of waste by any number of incineration methods and the associated production of energy. The forms of energy that can be produced include hot air, hot water, low and high pressure steam, and the co-generation of electrical power.

Enhancement Measures - measures to increase the positive effects and any net effects (after implementing mitigative measures) of establishing an undertaking.

Environment - is defined in the Environmental Assessment Act, as follows:

"environment" means:

i) air, land or water,
ii) plant and animal life, including man,
iii) the social, economic and cultural conditions that influence the life of man or a community,
iv) any building, structure, machine or other device or thing made by man,
v) any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from the activities of man, or
vi) any part or combination of the foregoing and the interrelationship between any two or more of them.

Environmental Assessment - a planning process by which the environmental effects of various alternative courses of action are identified and evaluated for the purpose of gaining approval for a proposed undertaking under the Environmental Assessment Act.

- Also see Section 5.(1) and 5.(3) of the Environmental Assessment Act.

Epidemiology - the study of the causes, transmission, and incidence of diseases in communities or other population groups.

Erosion - the wearing away of the land surface normally by wind or running water.

Evaluation Criteria - a set of factors used to determine the suitability of two or more alternatives on the basis of a common method of comparison.

Evaporation - the physical transformation of a liquid to a gas at any temperature below its boiling point.

- the process of turning liquid into vapour through the addition of heat.

Evapotranspiration - the combined loss of water from soil and plant surfaces by direct evaporation and by transpiration.

Exhaust System - the system comprised of a combination of components which provides for enclosed flow of exhaust gas from the furnace exhaust port to the atmosphere.

Explosive Wastes - wastes which are unstable and may readily undergo violent chemical change or explode. Such wastes may react violently on contact with air or water, or form explosive mixtures, or generate toxic fumes when mixed with water (MOE).

Exposure - being subjected to.

Exposure Assessment - describes the kinds of people exposed to a chemical (whole populations, children, expectant mothers, etc.) and the magnitude and duration of that exposure.

Extraction Test Procedure - a series of laboratory operations and analyses designed to determine whether, under severe conditions, a solid waste, stabilized waste or landfill material can yield a hazardous waste.

"F"

Factor - a consideration which would assist in comparing the positive or negative aspects of options or alternatives.

Fauna - the animal life adapted for living in a specified environment. The animals living within a given area or environment or during a stated period.

Fermentation - an energy yielding oxidation in which the oxidant is organic.

Ferrous Metals - metals containing iron as the chief constituent. All alloys of steel and iron.

Field Capacity - quantity of water held by compacted solid waste where application of additional water will cause it to drain rapidly to underlying material.

Fill - the placement of sand, clay, sediment or other types of material, usually in submerged lands or wetlands, to create new uplands or raise the elevation of land.

Fill Area - the area of a waste disposal site set aside for landfilling or dumping (MOE).

Fill Line - a line delineating limits within which the placement or removal of fill may effect the control of flooding, the conservation of land, or the pollution of a watercourse. The lines are plotted on base maps and generally encompass an area slightly more extensive than that of the related regulatory floodplain, specifically to protect ravine slopes wherever possible. Fill lines are plotted to follow features, such as fence lines, that can be easily identified in the field.

Filter - a porous device through which a gas or liquid is passed to remove suspended particles or dust.

Filtration - the physical removal of solid particles from an aqueous waste stream by using a filter medium.

Final Closure - operational and engineering measures that are taken to ensure a former landfill operation will remain environmentally safe and acceptable.

Final Cover - cover material that is applied upon closure of a landfill and is permanently exposed to the surface.

Finance - consideration of the way in which the money to pay for a project is raised and financed.

Firebrick - refractory brick made from fireclay.

Fireclay - a sedimentary clay containing only small amounts of fluxing impurities high in hydrous aluminum silicate and capable of withstanding high temperatures.

Fire Point - the lowest temperature at which an oil vapourizes readily enough to burn at least five seconds after ignition.

Fixed Carbon - the ash-free carbonaceous material that remains after volatile material is driven off a dry solid waste sample.

Fixed Grate - a grate without moving parts, also called a stationary grate.

Flash Drying - the process of drying a wet organic material by passing through a high temperature zone at such a rated that the water is rapidly evaporated but the organic material, protected by the boiling point of water, is not overheated.

Flash Point - the minimum temperature at which a liquid or solid gives off sufficient vapour to form an ignitable vapour-air mixture near the surface of a liquid or solid.

Flood, A Regional/100 Year - a standard statistical calculation used to determine the probability of severe flooding. It represents the largest flood which has a 1 percent chance of occurring in any one year in an area.

Floodline - a line delineating the extent of flooding which would occur due to either an engineered flood event or observed flood levels.

Flood Way - the normal stream channel and that adjoining area of the material floodplain needed to convey the waters of a regional flood while causing less than one foot increased in upstream flood elevations.

Flora - the plant life characteristics of an area or region.

Flue - any passage designed to carry combustion gases and entrained particulates.

Flue Gas - the products of combustion, including pollutants, emitted to the air after a production process or combustion takes place.

Fluidized Bed Combustion - is a technology where solid fuels are burned in a hot bed of sand which is fluidized by blowing in air at the bottom of the bed.

Fly Ash - means particulate matter removed from combustion flue gases (Ontario Reg. 309).

- the airborne combustion residue from burning fuel,
- non-combustible particles carried by flue gas.

Forced Draft - the positive pressure created by the action of a fan or blower which supplies the primary or secondary combustion air in an incinerator.

Fossil Fuel - natural gas, petroleum, coal, and any form of solid, liquid, or gaseous fuel derived from such materials for the purpose of creating useful fuel.

Front-End Process - generally refers to those methods of waste management which are undertaken to prepare waste for further processing or management. Volume reduction, magnetic separation and shredding are examples of front-end processes.

Fuel - any material which is capable of releasing energy or power by combustion or other chemical of physical means.

Fugitive Emissions - emissions other than those from stacks or vents which are not planned,

- pollutants released into the atmosphere from sources other than a stack.

Fume - solid particles under one micron in diameter formed as vapours condense or as chemical reactions take place.

Furans - brief name for a group of 135 chemically related substances in the category of polychlorinated dibenzofurans, seven of which are considered to be quite toxic, but not as toxic as dioxins (TCDD). Furans are often found where dioxins are present.

Furnace - a combustion chamber; an enclosed chamber structure in which heat is produced.

Fusion Point - the temperature at which a particular complex mixture of minerals can flow under the weight of its own mass.

"G"

Generation - the creation of waste.

Generator - any person, or corporation, or site, who by virtue of ownership, management, operation or control, causes or allows to be caused, the creation or storage of wastes.

- means the operator of a waste generation facility (Ontario Reg. 309).

Generic - having a wide general application, and referring to a kind, class or group. Often used to refer to groups (i.e. approaches to) of waste management technologies (i.e. incineration) rather than specific types (i.e. particular methods of incineration such as mass burning or semi-suspension incineration).

- applied to a wide group; general, not specific or special.

Geology - the structure of the earth in a given region. The science of the composition, structure and history of the earth.

Germorphology - the study of nature and origin of the earth's topographic features.

Glaciolacustrine - fine grained sediments that have settled from suspension and resulting from the melting of glacial lakes.

Goal - a broad statement of what should exist in a community or what the community wants to achieve in the future usually determined through citizen involvement.

Gradient - slope along a specific route, as of a road surface, channel or pipe.

Grate - a piece of furnace equipment used to support solid waste or solid fuel during drying, igniting and burning processes.

Grinder - a mechanical device used to pulverize waste material into powder or small particles by a friction action (see hammermill).

Grinding - means the treatment of waste by uniformly reducing the waste to particles of controlled maximum size (Ontario Reg. 309).

Groundwater - water occurring in the zone of saturation in an aquifer or soil and which flows in response to gravitational forces. Very often the source of water for communities and industry.

- a body of water, generally within the boundaries of a watershed, which exists in the internal passageways of porous geological formations (aquifers) and which flows with gravity (MOE).

Groundwater Discharge Area - an area where water in the saturated zone travels upward toward the water table.

Groundwater Flow Path - the directions in which groundwater flows within an aquifer.

Groundwater Recharge Area - an area where water that percolates through the water table travels downward into the saturated zone.

Grout - a cement slurry of high water content, fluid enough to be poured or injected into spaces and thereby fill or seal them.

Guideline - any suggestion, rule, etc. that guides or directs.

"H"

• **Habitat** - the place or type of site where an animal or plant naturally or normally lives (from Ministry of Natural Resources).

Halogenated - refers to compounds containing fluorine, chlorine, bromine, iodine or astatine.

Hammermill - a grinding machine that operates by impaction of material against heavy metal hammers loosely pinned to a rotating shaft.

Hardness - a characteristic of water, imparted by salts of calcium, magnesium, and iron that causes curdling of soap, deposition of scale in boilers, damage in some industrial processes, and sometimes objectionable taste.

Hardpan - hardened, compacted or cemented soil.

Haul - the transportation of waste on public roads to a waste disposal or treatment facility following the process of collection.

Hauled Liquid Industrial Waste - means liquid industrial waste transported in a tank or other container for treatment or disposal (Ontario Reg. 309).

Hazard Identification - involves gathering and evaluating information on the types of health injury or disease that may be produced by a chemical and on the conditions of exposure (e.g. inhalation, ingestion, or skin absorption) under which the injury or disease is produced.

Hazard Land - land, which because of its physical characteristics in combination with its location, presents a risk for its occupants including loss of life, property damage and social disruption; for example, flooding (from Ministry of Natural Resources).

Hazardous Waste - see Ontario Regulation 309 to the Environmental Protection Act.

- a waste, or combination of wastes, which because of its quantity, concentration, toxicity, corrosiveness, mutogenicity or flammability, or physical, chemical or infectious characteristics may (1) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness, (2) pose a substantial present or potential hazard to human health or the natural environment when improperly treated, stored, transported, or disposed, or otherwise managed.

- waste that poses a present or potential danger to human beings or other organisms because it is toxic, ignitable, explosive, reactive, corrosive, radioactive, pathological or has some other property that produces substantial risks to life.

Hazardous Waste Leachate - the liquid that has percolated through or drained from hazardous waste emplaced in or on the ground (MOE).

Hazardous Waste Management - the systematic control of the collection, source separation, storage, transportation, processing, treatment, recovery, and disposal of hazardous wastes (MOE).

Head - a measurement of pressure in a fluid system. Expressed as the height of an enclosed column of fluid which can be balanced by the pressure in the system.

Hearth - the bottom of a furnace on which waste materials are exposed to the flame.

Heat Balance - an accounting of the distribution of the heat input and output of an incinerator or boiler, usually on an hourly basis.

Heating Value - the heat released by combustion of a unit quantity of waste or fuel, measured in British Thermal Units (BTU) or kilojoules (1 BTU = 1.056 kilojoules).

Heavy Metals - metallic elements such as mercury, chromium, lead, cadmium and arsenic with high atomic weights, and which tend to accumulate in the food chain,

- metallic elements having a high density and usually toxic.

- a group of metals which include the following: aluminium, zinc, chronium, nickel, copper, tin, silver, cadmium, lead, arsenic, antimony, mercury, iron and cobalt.

Hectare - a unit of area in the metric system equal to approximately 2.47 acres.

Heritage Resource - includes property of historic, architectural, archaeological, aesthetic, and scenic interest.

Hetrogeneous - consisting of dissimilar ingredients or constituents.

Historic Theme Segment - a theme segment represents an important phase of a distinctive activity which took place in a specific time and place within Ontario (from Ministry of Natural Resources).

Humus - decayed organic matter. A dark fluffy swamp soil composed chiefly of decayed vegetation; also called peat.

Hydrapulper - a large mechanical device used in the paper industry to pulp waste paper and separate foreign matter.

Hydraulic Capacity - rating given to processing equipment regarding the volume of liquid which can be handled.

Hydraulic Conductivity - the ability of soil or rock to transmit water. The higher the hydraulic conductivity, the greater the ability to transmit water.

- a measure of the rate with which overburden or bedrock material will permit the movement of water.

Hydraulic Gradient - the change in head per unit of distance in a given direction.

Hydrocarbon - any of the vast family of compounds containing hydrogen and carbon in various combinations, found especially in fossil fuels.

- a compound containing both hydrogen and carbon.

Hydrodynamic Dispersion - can be a physical or chemical process whereby contaminants introduced to an environment tend to spread out from the path of flow and mix with groundwater. Mechanical dispersion is the physical movement of contaminants through pore spaces, between soil grains or through fractures in the soil. Also see Molecular Diffusion.

Hydrology - the science of dealing with the properties, distribution and flow of water on and beneath the land surface.

Hydrogeology - the study of the occurrence, movement and chemistry of groundwater in relation to the geologic environment.

- the science dealing with subsurface waters and with related geologic aspects of surface waters.

"I"

Ignitability - the characteristic property of liquids having a flash point of less than 65 degrees Centigrade; non-liquids liable to cause fires through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing, or are liable, when ignited to burn so vigorously and persistently as to create a hazard; ignitable compressed gas; oxidizers.

Ignition Temperature - the lowest temperature of a fuel at which combustion becomes self sustaining.

Impact - the predicted negative consequences (public health and safety, environmental, social/cultural, economic) of a proposed environmental undertaking.

Impact Management - refers to the strategy that may be used to avoid or reduce the severity of impacts.

Impoundment - the restraint of a flowable material behind a structural barrier, such as a dam, levee, dike or pond (MOE).

Impermeable - resistant to flow of, or penetration by water or other liquids.

Incineration - the controlled combustion process of burning solid, liquid of gaseous combustible wastes to gases and to a residue and ash containing little combustible material.

- an engineered process using controlled flame combustion to thermally degrade waste materials,

- means the treatment of waste by controlled burning, including measures for limiting air pollution, to reduce the volume of the waste and to leave it in a more stable form for disposal (Ontario Reg. 309).

Incinerator Ash - means the ash residue, other than fly-ash, resulting from incineration where the waste is reduced to ashes containing by weight less than 10 percent of combustible materials (Ontario Reg. 309).

Incinerator Stoker - a mechanically operable moving grate arrangement for supporting, burning or transporting solid waste in a furnace and discharging the residue.

Incinerator Waste - means the residue from incineration, other than incinerator ash and fly-ash (Ontario Reg. 309).

Induced Draft - the negative pressure created by the action of a fan, blower or other gas moving device located between the incinerator and the stack.

Industrial Waste - solid, non-hazardous waste generated by business and industry. Collection (and sometimes disposal) is usually the responsibility of the industrial generator. It does not include liquid waste or hazardous waste.

Inert Fill Waste - uncontaminated earth or rock fill, also referred to as backfilling waste. These wastes typically contain no soluble or decomposable chemical substances.

- means earth or rock fill that contains no putrescible materials or soluble or decomposable chemical substances (Ontario Reg. 309).

Infectious - capable of transmitting diseases caused by pathogenic organisms.

Infiltration - water that penetrates the soil from the ground surface.

Inorganic Matter - chemical substances of mineral origin, not containing carbon to carbon bonding.

Integrated Resource Management - the coordination of resource management programs to ensure that conflicts are minimized and that management would benefit several programs is encouraged. Integrated management encourages multiple use, but recognizes that in some circumstances management of areas for a single purpose may be necessary (from Ministry of Natural Resources).

Interim Use - land and resource use and management practices which are permitted to occur over a period of time prior to the initiation of another identified use (from Ministry of Natural Resources).

Intermediate Cover - soil material placed on completed lifts in areas where there is clear intention to place another lift on top within one year (MOE).

Ion - an electrically charged atom or group of atoms.

Isotropic - having the same properties in all directions. Metals are practically isotropic. Often used by hydrogeologists to describe soil characteristics (see anistropic and orthotropic).

"K"

Kraft Paper - a comparatively coarse paper, noted for its strength and used primarily as a wrapper or packaging material.

"L"

Lagoon - a pond containing raw or partially treated wastewater in which aerobic or anaerobic stabilization occurs. Generally, any pond for the temporary or permanent storage of liquid.

Landfarming - application of waste onto land and incorporation into the surface soil for the purposes of attenuation and biological treatment.

Landfill - a land disposal site employing an engineered method of disposing wastes on land in a manner that minimizes environmental hazards by spreading wastes in thin layers, compacting the wastes to the smallest practical volume, and applying cover materials at the end of each operating day (MOE).

Landfilling - means the disposal of waste by deposit, under controlled conditions on land or on land covered by water, and includes compaction of the waste into a cell and covering the waste with cover materials at regular intervals (Ontario Reg. 309).

Land Use - any existing or proposed activity, structure, service, facility of natural feature, either at, above or below grade which conforms to an approved municipal plan (MOE).

- a term used to indicate the utilization of any piece of land. The way in which land is being used is the land use.

Land Used For Waste Disposal Purposes - the land comprised of the fill area where landfilling or dumping has occurred, the leachate buffer area and/or the gas buffer area (MOE),

Leach - to dissolve out by the action of a percolating liquid.

Leachate - a liquid produced from a land disposal cell that contains dissolved, suspended and/or microbial contaminants from the solid waste.

- leachate is any water that has been contaminated by chemicals that have been leached from the landfill including leachate springs.

- the fluid stream which issues from a pile or cell of solid materials and which contains water, dissolved solids, and decomposition products of the solids (MOE).

Leachate Buffer Area - a buffer area adjacent to the fill area where contaminants will be naturally or technically attenuated (MOE).

Lethal Dose - the quantity of a substance which is fatal to 50 percent of the population on which it is tested.

License - often used as a synonym for Certificate of Approval.

Lift - means the vertical thickness of a compacted volume of solid waste and the cover material immediately above it. Usually a lift represents the quantity of waste disposed in a landfilling cell in one day.

Lime - any of the family of chemicals consisting essentially of calcium oxide or hydroxide made from limestone (calcite).

Liner - a relatively thin structure of natural clay or manufactured material (various plastics) which serve as barriers to prevent leachate from reaching or mixing with groundwater in landfills, lagoons, etc.

- the material used on the inside of a landfill to ensure that the basin is impervious to fluids (MOE),
- an impermeable barrier manufactured, constructed or existing in a natural condition that is utilized to collect leachate (MOE).

Liquid - refers to wastes which are pumpable under normal conditions.

Litter - highly visible portion of solid waste which is carelessly discarded outside the regular disposal system or not properly managed after receipt at a waste management facility.

Loam - a soft, easily worked soil containing sand, salt and clay.

Lysimeter - a sampling instrument used to monitor and measure the quantity or rate of water movement through soil, natural or artificial liners, or to collect percolated water for analyses.

"M"

Macro - large.

Macroencapsulation - the isolation of a waste by embedding it in or surrounding it with a material which acts as a barrier to water or air.

Magnetic Separator - the process by which a permanent magnet or electromagnet is used to attract magnetic (i.e. ferrous) materials away from mixed waste.

Major Constraints - the presence of these types of constraints suggests a candidate (method or site) should be avoided.

Manifest - means the form used for identifying the quantity, composition, and the origin, routing, and destination of hazardous waste during its transportation from the point of generation to the point of disposal, treatment, or storage.

Manual Separation - the separation of waste materials by hand. Sometimes called hand-picking, manual separation is done in the home or office by keeping garbage separate from newspapers, cans and bottles; or in a recovery plant by picking out certain materials usually along a conveyer line and often aided by front or back end mechanical processing.

Masking - blocking out sight, sound or smell with another.

Mass Burning - the incineration of waste "as received".

Material Recovery - is a mechanical process utilizing high technology equipment to recover and reuse up to 90 percent (by weight) of the waste stream. For example, RDF recovery for subsequent use as a fuel.

Metabolic - refers to the exchange of matter and energy between an organism and its environment and the transformation of this matter and energy within the organism.

Metes and Bounds - a system of describing and identifying a tract of land by distance (metes) and direction (bounds) from an identifiable point of reference such as the monument of quarter section of land.

Methane - an odourless, colourless, non-poisonous and explosive gas when mixed with air or oxygen in certain proportions. One source is from landfilling sites undergoing anaerobic microbial decomposition.

Methods of - in the context of the Environmental Assessment Act, refers to specific types of waste management as opposed to generic approaches. Mass burning is a method of an incineration approach to waste management.

Micro - small.

Microencapsulation - the isolation of a waste from external effects by mixing it with a material which then cures or converts it to a solid, non-leaching barrier.

Micro-Organisms - a living organism not discretely visible to the unaided eye. These organisms obtain nutrients from and discharge waste products into the fluid in which they exist, thus serving to lower the nutrient level.

Milled Refuse - solid waste that has been mechanically reduced in size.

Mining Rights - the right to work the ores and minerals on or under any land. These may be granted separately from surface rights (from Ministry of Natural Resources).

Mist - liquid particles, measuring 40 to 500 microns in diameter, that are formed by condensation of vapour.

Mitigation - any action with the intent to lessen or moderate potential negative effects.
- refers to methods that may be used to prevent, avoid or reduce the severity of risks, impacts or service and cost concerns. Examples of mitigative measures are the application of berms to reduce visual and noise impacts, and emergency spill response procedures.

- also see enhancement measures.

Mixing Chamber - a chamber usually placed between the primary and secondary combustion chambers and in which the products of combustion are thoroughly mixed by turbulence that is created by increased velocities of gases, checkerwork, or turns in the direction of the gas flow.

Modular Incineration - small scale incineration units typically in the 50 to 100 TPD range which are factory constructed and shipped to the buyer ready to be installed with a minimum of field installation work.

Molecular Diffusion - is a chemical process where concentrated solute mixtures spread out from a zone of high chemical concentration to a zone of lower chemical concentration.

Monitoring Well - a well used to obtain water samples for water quality analysis or to measure groundwater levels.

Monolithic - describing a structure which is without cracks or seams, self supporting and essentially homogeneous.

Movable Grate - a grate with moving parts.

Multi-Material - associated with recycling activities and includes a wide range of recyclable waste but normally paper, glass, plastic and metal.

Municipal Waste - it consists of domestic waste and commercial and industrial wastes of similar composition in any combination or proportion but does not include liquid waste or hazardous waste (MOE),

- solid non-hazardous waste generated from residential, commercial and institutional sources. It does not include liquid waste of hazardous waste.

Municipal Waste Landfill - a waste disposal site operating under a Certificate of Approval or Provisional Certificate of Approval as a landfilling site and authorized to accept for landfilling only domestic waste or only domestic waste in combination with either or both commercial waste or industrial waste but not including liquid waste or hazardous waste (MOE).

Municipal Waste Management System - means a waste management system, or any part thereof, of which a municipality is the owner (Ontario Reg. 309).

Mutagenic - the property of a substance or mixture of substances which, when it interacts with a living organism, causes the genetic characteristics of the organism to change and its offspring to have a decreased life expectancy.

"N"

Natural Draft - the negative pressure created by the height of a stack or chimney and the difference in temperature between flue gases and the atmosphere.

Natural Environment - the air, land, water, biota or any combination or part thereof.

Natural Environmental Park - an area incorporating outstanding recreational landscapes with representative natural features and historic resources to provide high quality recreational and educational experiences (from Ministry of Natural Resources).

Natural Gas - a natural fuel containing methane and hydrocarbons that occur in certain geologic formations.

Nature Reserve - an area designated as a provincial park and selected to represent the distinctive natural habitats and landforms of the province, and are protected for educational and research purposes to benefit present and future generations (from Ministry of Natural Resources).

Net Effects - in the context of the environmental assessment evaluation process, refers to the residual environmental effects (both positive and negative) that remain on balance after potential mitigative measures are added to the gross negative effects and potential enhancement measures are added to the gross positive effects of each alternative under consideration (MOE).

- the advantages and disadvantages of each alternative under each factor after mitigation potential has been taken into account.

Neutralization - the chemical process in which the acidic or basic characteristics of a fluid are changed to those of water.

Nitrification - the conversion of nitrogenous matter into nitrates by bacteria.

Non-Ferrous - metals that contain no iron such as aluminum, copper, brass and bronze materials.

Non-Hazardous Solid Industrial Waste - means industrial waste that is not liquid industrial waste and is not hazardous waste and includes asbestos waste (Ontario Reg. 309).

Non-Processable Wastes - those types of wastes which would not be suitable for recycle or reuse or acceptable at an energy-from-waste or a materials recovery facility. It does not include liquid waste or hazardous waste.

Non-Putrescible Waste - material that is either inert or decomposes so slowly that is normally does not pose health or environmental problems (e.g. tree stumps, some construction and demolition debris, etc.). Also referred to as backfilling or inert waste. Often non-putrescible waste is referred to as industrial waste. It does not include liquid waste or hazardous waste.

Nuisance Factors (Landfill) - nuisance concerns most often related to effects from operating disposal (landfill) sites. Those factors which would normally produce only nuisance effects include: dust, odour, noise, litter, air emissions from equipment, visual impact (MOE).

- anything that interferes with the use or enjoyment of property or is offensive to the senses.

Null Alternative - refers to the option of maintaining the status quo,

- to do nothing with regard to waste management in the study area (MOE).

"O"

Observation Well - a well installed to enable the measurement of the groundwater level, the sampling of groundwater and testing of the characteristics of the surrounding overburden or bedrock.

Odourant - a gaseous nuisance which is offensive or objectionable to the olfactory senses.

Odour Threshold - the lowest concentration of an airborne odour that a human being can detect.

Offal - the viscera and trimmings of a slaughtered animal removed from the carcass.

Official Plan - means a document approved by the Minister, containing objectives and policies established primarily to provide guidance for the physical development of a municipality or a part thereof or an area that is without municipal organization, while having regard to relevant social, economic and environmental matters (Planning Act, 1983).

Off-Site - means any site that does not meet the definition of "on-site" as defined in this section.

Ontario Waste Management Corporation (OWMC) - is a provincial crown agency, its mandate is to implement a province-wide, long term program for the management of liquid industrial and hazardous wastes.

On-Site - means on the same or geographically contiguous property. Two or more pieces of property which are geographically contiguous and are divided by public or private right(s)-of-way are considered a single site.

On-Site Incinerator - means an incinerator that is located in a building or structure used principally for functions other than waste management (Ontario Reg. 309).

Opacity - degree of obstruction of light; eg. a window has zero opacity, while a wall has 100 percent opacity.

- means:

i) the colour of a visible emission in shades of grey to black, or
ii) the degree to which a visible emission obstructs the passage of light (Ontario Reg. 308).

Open Burning - uncontrolled burning of wastes in the open or in a dump.

- the combustions of any material without:

a) control of combustion air to maintain adequate temperature for efficient combustion,

b) containment of the combustion-reaction in an enclosed device to provide sufficient residence time and mixing for complete combustion, or

c) emission of the combustion products through a stack or vent adequate for both visual monitoring and point source sampling (MOE).

Operating Costs - expenditures incurred in the operation and maintenance of waste management programs and facilities.

Optimum Sustainable Yield - the concept refers to the maximum level of resource harvest which can be sustained on a long term basis without causing detrimental effects on the resource base (from Ministry of Natural Resources).

Organic - containing carbon.

Organic Compounds - include all substances such as dioxins, furans, herbicides and other carbonaceous organic matter. Often very small concentrations of dioxin and furans pose a public health hazard.

Organic Matter - chemical substances comprised mainly of carbon, covalently bonded. May have its origin in animal or plant life, coal, petroleum, or laboratory synthesis.

Organic Soil Conditioning - means the incorporation of processed organic waste in the soil to improve its characteristics for crop or ground cover growth (Ontario Reg. 309).

Orthotropic - a description of the physical properties of any material which has pronounced differences in two or more directions at right angles to each other.

Overburden - the depth of soil from surface to bedrock.

Other Constraints - considered when comparing candidates for a specific situation or a specific site. The feasibility of mitigative measures are also considered in this comparison.

Overburden - the loose soil and rock materials which lie above solid bedrock.

Oxidation - the addition of oxygen to a compound.

Oxide - a compound of two elements, one of which is oxygen.

"P"

Packed Tower - a pollution control device that forces dirty gas through a tower packed with crushed rock, wood chips, or other packing while liquid is sprayed over the packing material. Pollutants in the gas stream either dissolve in or chemically react with the liquid.

Packing and Baling - means the treatment of waste by its compression into blocks or bales and binding or sheathing the blocks with wire, metal, plastic or other material (Ontario Reg. 309).

Particulate Matter - any material, except water in an uncombined form, that is or has been airborne and exists as a liquid or solid at standard conditions.

Particulates - fine liquid or solid particles such as dust, smoke, mist, fumes or smog, found in the air or in emissions.

Pathogen - an organism, chiefly a micro organism, including viruses, bacteria, fungi, and all forms of animal parasites and protazoa, capable of producing an infection or disease in a susceptible host.

Pathological Waste - those liquid or solid wastes generated in hospitals, laboratories, research institutions and similar complexes, which are offensive to the senses, or hazardous to the health. Examples are: anatomical wastes (tissues, limbs, carcasses) and infectious waste such as syringes, needles, diseased organs, petri dishes and other vessels containing cultures, and other similar materials in which pathogenic bacteria might be present.

Perched Water Table - underground water lying over dry soil, and sealed from it by an impervious layer.

Percolation - a qualitative term applying to the downward movement of water through soil.

Peripheral Area - the area controlled by the applicant between the boundary of the waste disposal site and the fill area. Together the peripheral area and other fill area make up the waste disposal site. The peripheral area will contain the buffer areas required to be on site, and the maintenance area. It is the portion of a landfill or a dump which is not a fill area (MOE).

Permeability - the capacity of a porous medium to transmit a liquid or gas.

Permeable - permitting the flow of water or other liquids. The property of a solid material which allows fluid to flow through it. Usually described as a rate of penetration at a defined pressure.

Perpetual Care - the on-going maintenance of a landfill site and other types of waste management facilities following closure. Refers to necessary post-closure activities including monitoring and maintenance.

- maintenance and/or monitoring which must be undertaken continually and eternally.

Pest - any injurious, noxious or troublesome plant or animal life other than man and includes any injurious, noxious or troublesome organic function or a plant or animal.

PET - stands for polyethylene terephthlate beverage container. A four material container, incorporating a high density polyethylene base cup attached to a plastic container. Utilized in the soft drink industry for convenience and is recyclable.

pH - the measure of the acidity or alkalinity measured on a scale from 0 to 14. Neutral water, for example, has a pH value of 7, an acidic solution less than 8, and an alkaline solution greater than 7.

Phenols - organic compounds that contain an hydroxyl group (OH) bound directly to a carbon atom in a benzene ring. They are by-products of petroleum refining, textile, dye and resin manufacturing.

Physiographic Region - areas with recognizable local landform patterns (from Ministry of Natural Resources).

Plastics - non-metallic compounds that result from a chemical reaction and are molded or formed into rigid or pliable structural material.

Plume - visible emissions from a stack or chimney,
- detectable contaminates in water.

Point of Emission - means the point at which a contaminant enters the natural environment (Ontario Reg. 308).

Point of Impingement - the point where the pollutant comes into contact with humans, animals, vegetation, or property that it may harm.

Policy - a more specific statement than a goal; a policy describes a particular course of action to accomplish the purposes of a plan. Policies represent the will of the people translated into decision-oriented statements.

Polychlorinated Biphenyls (PCB)s - a family of very stable organic compounds of low flammability which contain 12% to 68% chlorine. They were used extensively as electrical insulating fluids until the mid-1970s.

Polynuclear Aromatics - a class of organic materials with characteristic multiple ring molecular structure which is suspected of causing genetic damage.

Polyvinyl Chloride (PVC) - a common plastic material that releases hydrochloric acid when burned.

Porosity - the ratio of the volume of pores of a material to the volume of its mass.

Post-Closure Care - the monitoring maintenance and activities conducted after closure for a waste management facility.

Potable Water - water that is bacteriologically and chemically safe for human consumption.

Potential Effects - probable positive and negative effects that would occur as the result of establishing a facility, program or activity having regard for the natural, public health and safety, social/cultural, economic, financial technical and land use/planning effects.

Pour Point - the lowest temperature at which an oil will flow or can be poured under specified conditions of test.

PPM - Parts per million (1:10^6).

PPB - Parts per billion (1:10^9).

PPT - Parts per trillion (1:10^{12}).

Precipitation - a physical/chemical technology in which dissolved chemical species in solution (e.g. metals) are transformed into a solid phase (precipitate) which can subsequently be separated from the solution by physical means.

Precipitators - air pollution control devices that collect particles from an emission by mechanical or electrical means.

Primary Combustion Air - the air admitted to a combustion system when the fuel is first oxidized.

Primary Method of Waste Management - capable of managing 50 percent or more of total waste generated.

Primary Pollutant - a pollutant emitted directly from a polluting stack.

Private Waste Management System - means a waste management system, or any part thereof, of which a person other than a municipality is the owner (Ontario Reg. 309).

Process Waste - any designated toxic pollutant which is inherent to or unavoidable resulting from any manufacturing process, including that which comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, by-product, or waste product (MOE).

Processable Wastes - those types of waste which would be suitable for recycle and reuse and acceptable at an energy-from-waste or a materials recovery facility. Some processable wastes may be separated at source.

Processed Organic Waste - means waste that is predominantly organic in composition and has been treated by aerobic or anaerobic digestion, or other means of stabilization, and includes sewage residue from sewage works that are subject to the provisions of the Ontario Waste Resources Act (Ontario Reg. 309).

Production Forest Land - an area dedicated to the growing of merchatable timber or the production of other forest products (from Ministry of Natural Resources).

Productivity - a ratio of output to the input required to produce a substance.

Proponent - is defined in the Environmental Assessment Act as follows:

means a person who,

i) carries out or proposes to carry out an undertaking, or
ii) is the owner or person having charge, management or control of an undertaking.

Public Land - any land owned or administered by a public body or agency. It includes federal, provincial and municipally owned lands, and lands held by agencies such as parks commissions and conservation authorities (from Ministry of Natural Resources).

Pumping Test - a test performed on a well to determine characteristics of the aquifer,

Pumping Well - a water well used to pump groundwater to the surface. It is usually a larger diameter well than an observation well.

Putrescible Waste - material that is capable of being decomposed by micro-organisms with sufficient rapidity as to cause nuisances from odours, gases, etc. Kitchen and other organic type wastes are examples of putrescible components in solid waste. Often referred to as domestic/commercial waste. It does not include liquid waste or hazardous waste.

Pyrolysis - the burning of waste in an oxygen deficient atmosphere.

- the chemical decomposition of organic matter through the application of heat in an oxygen deficient atmosphere.

"Q"

Quarry - an excavation formed from excavating or mining rock.

Quaternary Geology - of the geological period and related to the glaciation of the last ice age.

Quench Tank - a water filled tank used to cool incinerator residues or hot materials during industrial processes.

"R"

Rated Incinerator Capacity - the number of tonnes of solid waste that can be processed in an incinerator per 24-hour period when specific criteria prevail.

Reactivity - the tendency to create vigorous reactions with air or water; tendency to explode; to exhibit thermal instability with regard to shock; ready reaction to generate toxic gases.

Receiver - means the operator of any facility to which waste is transferred by a carrier (Ontario Reg. 309),

Reciprocating Grate Stoker - a stoker with a bed of bars or plates arranged so that alternate pieces, or rows of pieces, reciprocate slowly in a horizontal sliding mode and act to push the solid waste along the stoker surface.

Reclamation - includes waste reuse, reduction, recycle and recovery.

Recoverable Resources - materials that have useful physical or chemical properties after having served a specific purpose and can, therefor, be reused or recycled for the same or other purposes (from Ministry of Natural Resources).

Recovery - the recovery of material resources or energy resources from mixed solid wastes.

Recreation Park - an area which supports a wide variety of outdoor recreation opportunities for a large number of people in attractive surroundings (from Ministry of Natural Resources).

Recyclable Material - means waste transferred by a generator and destined for a site,

- i) where it will be wholly utilized, in an on-going agricultural, commercial, manufacturing or industrial process or operation used principally for functions other than waste management and that does not involve combustion or land application of the waste,
- ii) where it will be promptly packaged for retail sale, or
- iii) where it will be offered for retail sale to meet a realistic market demand,

but does not include hazardous waste or liquid industrial waste unless the transportation from generator to site is direct (Ontario Reg. 309).

- a material that is used in place of a primary, raw, or virgin material in manufacturing a product and consists of materials derived from post consumer waste, industrial scrap, and material derived from agricultural wastes and other items, all of which can be used in the manufacture of new products (MOE).

Recycling - the use of a waste material as a replacement for all or part of a virgin material in a manufacturing process. For example, glass containers recycled to glass cullet used to produce more glass containers.

Reduction - includes measures for preventing the generation of, or facilitating the recycling of wastes. For example, the substitution of refillable bottles for a throwaway container.

Refractory Material - non-metallic substances used to line furnaces because they can endure high temperatures and resist abrasion, spalling and slagging.

Refractory Wall - the wall of a furnace made of heat resistant material.

Refuse - all solid materials which are discarded as useless.

Refuse Derived Fuel (RDF) - refers to any usable fuel produced by mechanically, thermally, chemically, or biologically processing solid waste. Typically RDF is uniform in size and from which glass, metals, ceramics and other non-combustible materials have usually been removed.

- the combustible or organic portion of municipal waste that has been separated out and processed for use as fuel (MOE).

Regional Flood - the flooding that results from entering a regional storm on a watershed under study. A regional flood is not a 100 year flood. A 100 year flood is a flood which has a one percent chance of occurring in any given year. Rainfall data is superimposed on antecedent soil moisture conditions chosen during an engineering study. In the absence of recorded information of natural flood events, it is assumed that precipitation with a probability of occurrence of one percent during any one year would generate a 100 year flood.

Regional Storm - a tropical storm, based on the observed historical event known as Hurricane Hazel, that is used presently for regulatory purposes by the conservation authorities in Central and Southwestern Ontario.

Regulation - a specific law that legally applies in all relevant situations.

Regulation 309 - the set of rules under the Ministry of the Environment's Environmental Protection Act governing the identification, classification, registration and transportation of registerable wastes in the province.

Rendering - a process of salvaging fats and oils, animal feed, and other products from animal waste by cooking.

Residential Waste - solid, non-hazardous waste generated by households.

Residue - materials that remain after gases, liquids and/or solids have been removed. Solid or semisolid materials such as, but not limited to, ash ceramics, glass, metal and organic substances remaining after incineration or processing of waste.

Resource - any commodity that meets a need.

Resource Management - the control and coordination of the use of resources to achieve specific ends. Commonly applied in particular to natural resources (from Ministry of Natural Resources).

Resource Recovery - the processing of waste for material or energy recovery.

Retention Time - means the time waste is subjected to the combustion zone temperature.

Reuse - the direct reuse of materials which would otherwise become waste, providing a means of reducing the quantity of waste destined for landfill. For example, the use of refillable bottles.

Risk - probability of injury disease or death.

Risk Assessment - the scientific activity of evaluating the toxic properties of a chemical and the conditions of human exposure to it, both to ascertain the likelihood that exposed individuals will be adversely affected and to characterize the nature of the effects they may experience.

Risk Characterization - is a summary statement of the likelihood of injury or disease resulting from exposure to that chemical and a description of the uncertainties associated with the assessment.

Rotary Kiln - a cylindrical, inclined device that rotates, thus causing solid waste to move in a slow cascading and forward motion while it is burned.

Rubble - broken pieces of masonry, concrete and asphalt.

Runoff - the portion of precipitation or irrigation water that drains over the land as surface flow.

"S"

Salts - include iodized elements that will dissolve into the groundwater such as chlorides and sulphates. Because chloride is normally present in large quantities and can be readily dissolved into water, it can serve as a good indicator to confirm the presence of leachate.

Salvage - either the process or the product of controlled removal of solid waste materials for utilization.

Saturated Zone - or the zone of saturation is that part of the earth's crust in which all voids are filled with water.

Scavenging - means the uncontrolled removal of reusable material from waste at a waste disposal site (Ontario Reg. 309).

Scrubber Blowdown - the effluent from the scrubber system.

Scrubbing - the removal of impurities from a gas stream by spraying of a fluid.

Scrubbing System - an air pollution control device used to remove some stack gases (eg. sulphur dioxide and hydrogen chloride) and particulates before the air is released from the stack.

Secondary Burner - a burner installed in the secondary combustion chamber of an incinerator to maintain a minimum temperature and to complete the combustion of incompletely burned gas.

Secondary Combustion Air - the air introduced above or below the fuel (waste) bed by a natural, induced or forced draft.

Secondary Method of Waste Management - capable of managing less than 50 percent of total waste generated.

Secure Landfill - constructed in cell forms to segregate and isolate hazardous materials from each other and from contact with groundwater or atmosphere (MOE).

Semi-Suspension Burning - the incineration of pre-processed waste in suspension.

Sensitive Land Use - a land use where man or the natural environment may experience an adverse environmental effect resulting from expected emissions in the area (MOE),

- MOE considers any type of residential development, from single lot through multi-unit dwellings and subdivisions, institutional and recreational development requiring a quiet or scenic setting to be among the most sensitive land uses.

i) a permanent structure used in animal husbandry including mink farming;
ii) agricultural land used for pasturing livestock; or
iii) a permanent structure where

a) a person is employed, full-time for at least three months in a year, but not including food service facilities or motor vehicle service facilities adjacent to a highway, utility operations, scrap yards, heavy industrial uses, gravel pits, quarries, mining activities or forestry activities (MOE),

Sensitivity Analysis - an evaluation conducted to assess the impact of changes in the values of specific parameters.

Separation Distance - it means:

the distance measured from the perimeter of the landfilling area of a site to any above or below grade:

a) man-made structures, services or facilities,
b) human activities - conformity to approved municipal plans such as official plans, zoning by-laws, etc.)
c) part of the natural environment where the quality of any use that can be made of it, would be, or would likely be impaired.

- it is the shortest distance between a point in the fill area of a waste disposal site and a sensitive land use (MOE).

Sewage Sludge - a semi-liquid substance consisting of settled sewage solids combined with varying amounts of water and dissolved materials. A product of sewage treatment.

Shale - a sedimentary rock consisting of silt and clay particles and splitting readily into thin plates.

Shredder - a machine used to break up waste materials into smaller pieces by cutting or tearing. A front end process used in some incineration and resource recovery facilities. Sometimes used prior to landfilling.

Siftings - the fine materials that fall from a fuel bed through its grate openings during incineration.

Site - means one property and includes nearby properties owned or leased by the same person where passage from one property to another involves crossing, but not traveling along a public highway (Ontario Reg. 309),

- means the land or water area upon which a facility or activity is physically located or conducted, including but not limited to adjacent land use for utility systems, as repair, storage, shipping or processing areas, buffer areas, or other areas incident to the controlled facility or activity.

Site Selection - the process of locating and obtaining the use of suitable land; it is an important activity in the pre-operational steps in establishing a waste management facility.

Slag - the more or less completely fused and vitrified material separated during the reduction of metal from its ore.

Slagging - destructive chemical action that forms slag on refractory materials subjected to high temperatures; also a molten or viscous coating produced on refractory materials by ash particles.

Sludge - any solid, semisolid or liquid waste generated from a municipal, commercial or industrial wastewater treatment plant, water supply plant, or air pollution control facility, or any other such waste having similar characteristics and effects.

Slurry - a pumpable mixture of solids and fluid.

Smog - the irritating haze resulting from the sun's affect on certain pollutants in the air.

Smoke - particles suspended in air after incomplete combustion of materials containing carbon.

Solid Waste - non-hazardous, unwanted, discarded material. (Also see Domestic Waste; Commercial Waste; and Industrial Waste).

- any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities (MOE).

Solid Waste Management - the systematic control of the storage, collection, transportation, processing and disposal of solid domestic/commercial and non-hazardous industrial waste.

Solvent - a substance capable of, or used in, dissolving or dispersing one or more other substances.

Soot - carbon dust formed by incomplete combustion.

Source Reduction - reducing the amount of materials entering the waste stream by voluntary or mandatory programs to eliminate the generation of waste (MOE).

Source Separation - the segregation of various wastes at the point of generation (MOE),

- the setting aside of recyclable materials at the point of generation for segregated collection and transport to secondary materials facilities or specialized waste processing sites for recycling or final manufacture.

Special Waste - see Hazardous Waste.

Spill - means any unplanned discharge or release of waste onto or into the land, air, or water, or any accidental discharge of a waste into the land or water.

Spray Chamber - a chamber equipped with water sprays that cool and clean combustion products passing through it.

Stabilized Sludge - liquid or dewatered sludge from a municipal, commercial or industrial wastewater treatment plant that has been treated to significantly reduce pathogens.

Stack - any chimney, flue, vent, roof, monitor, conduit, or duct arranged to discharge emissions to the ambient air.

Stationary Source - any building, structure, facility or installation which emits or may emit any air pollutant.

Stoker - a mechanical device to feed solid fuel or solid waste to a furnace.

Storage - when used in connection with hazardous waste, means the containment of hazardous waste, either on a temporary basis or for a period of years, in such a manner as not to constitute disposal of such hazardous waste (MOE).

Subsidence - settling.

Sump - pit, tank or reservoir in which water is collected or stored.

Supernatant - the liquid remaining above a layer of settleable solids after the solids are collected at the bottom of a vessel.

Surface Water - means lakes, bays, ponds, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, and all other bodies of surface water, natural or artificial, public or private.

- water that collects on the surface of the land or that flows exclusively across the surface of the land from a point of origin to the point of departure.

Surficial - at or near surface. Generally applied to bedrock at or near the earth's surface.

Suspension - a mixture containing solid particles which are distributed throughout the fluid. The particles will ultimately settle out under the force of gravity.

Sustainable Development - development which ensure that the utilization of resources and the environment today does not adversely affect prospects for their future use by future generations.

Synergistic - interactions of two or more substances or organisms producing a result such that the total effect is greater than the sum of individual effects.

"T"

Tailings - second grade or waste material separated from pay material during screening or processing.

Tamp - pound or press soil or other material to compact it.

Teratogenic - affecting the genetic characteristics of an organism so as to cause its offspring to be misshapen or malformed.

Test Drilling - the drilling and sampling of boreholes to determine the geology and groundwater characteristics of an area.

Theoretical Air - the quantity of air, calculated from the chemical composition of a waste, that is required to burn the waste completely.

Thermal Efficiency - the ratio of heat used to total heat generated.

Thermal Treatment - means the treatment of solid waste in a device which uses elevated temperatures as the primary means to change the chemical, physical, or biological character or composition of the waste.

Threshold Dose - the minimum application of a given substance to produce a measured effect.

Tipping Fee - a charge established for the use of a waste management facility. The cost is calculated as a percentage of or equal to the total cost (capital and operating) of the facility.

Tipping Floor - unloading area for vehicles that are delivering waste to an incinerator, EFW or other waste processing facility.

Toe - the projection of the bottom of a landfill face beyond the top.

Topographic Map - a map indicating surface elevation and slope.

Topsoil - the uppermost layer of soil which is capable of supporting good plant growth.

Toxic - harmful, poisonous.

Toxicity - the degree of danger posed by a substance to animal or plant life.

Toxic Waste - a waste which can produce injury upon contact with, or by accumulation in, a susceptible site in or on the body of a living organism (MOE).

TPD - tonnes per day (estimated on the basis of the number of facility operating days per year).

TPY - tonnes per year.

Trade-Offs - refers to the comparison of alternatives and the selection of the preferred approach or option based on the relative differences.

Transfer Station - any building, structure or combination of structures, machinery or devices at a facility where solid waste is temporarily stored prior to bulking and transporting to a waste disposal site or treatment facility. Can be utilized as a waste processing facility.

- means a waste disposal site used for the purpose of transferring waste from a collection vehicle to another carrier for transportation to another waste disposal site (Ontario Reg. 309).

Transpiration - a form of evaporation where growing plants give up water to the air.

Trommel - a perforated, rotating, horizontal cylinder that may be used in resource recovery facilities to break open trash bags, to remove glass and such small items as stone and dirt, and to remove cans from incinerator residue.

"U"

Undertaking - is defined in the Environmental Assessment Act as follows:

i) an enterprise or activity or a proposal, plan or program in respect of an enterprise or activity by or on behalf of Her Majesty in right of Ontario, by public body or public bodies or by a municipality or municipalities, or

ii) a major commercial or business enterprise or activity or a proposal, plan or program in respect of a major commercial or business enterprise of activity of a person or persons other than a person or persons referred to in subclause (i) that is designated by the regulations.

Unreclaimable Residues - residual materials of little or no value remaining after the processing of waste by any type of approach including incineration (MOE).

User Fees - see Tipping Fees.

"V"

Vapour - the gaseous phase of substances that are liquid or solid at atmospheric temperature and pressure (i.e. steam).

Vapour Plume - the stack effluent consisting of flue gases made visible by condensed water droplets or mist.

Vector - a carrier that is capable of transmitting a pathogenic disease from one organism to another. Vectors could include flies and other insects, rodents, birds, and vermin.

Vermin - carriers of disease, germs, bacteria, or viruses such as rodents, mosquitoes, flies, lice and fleas which transmit such infectious elements to humans.

Virgin Material - any basic material for industrial processes which has not been previously used.

Vitrification - a process whereby high temperatures effect permanent chemical and physical change in a ceramic body.

Volatile - any substance that evaporates at a low temperature.

Volatility - the property of a substance or substances to convert into vapour or gas without chemical change.

Volatilized - evaporated.

"W"

Warm Water Fishery - a fresh water, mixed fish population with no salmonids.

Waste - solid and non-hazardous garbage or refuse which no longer serves any useful purposes in its present form and is discarded by its owner.

- includes ashes, garbage, refuse, domestic waste, industrial waste or municipal refuse and such other wastes as are designated in the regulations (Environmental Protection Act).

- it does not include liquid waste or hazardous waste.

Waste-Derived Fuel - waste transferred by a generator and destined for a waste-derived fuel site where it will be wholly utilized as a fuel or fuel supplement in a combustion unit (Ontario Reg. 309).

Waste-Derived Fuel Site - a waste disposal site where waste-derived fuel is wholly utilized as a fuel or fuel supplement in a combustion unit used principally for functions other than waste management and, for hazardous waste or liquid industrial waste, the site may include blending or bulking facilities but may not include facilities for treatment or processing of waste-derived fuel (Ontario Reg. 309).

Waste Disposal Site - includes the fill area and the buffer area. Also referred to as a landfilling site.

- means any land or land covered by water upon, into, in or through which, or building or structure in which waste is deposited or processed and any machinery or equipment or operation required for treatment or disposal of waste (Environmental Protection Act).

Waste Exchange - a system for waste information sharing between generators and other firms to facilitate the transfer of wastes to firms that can use the waste as raw materials.

Waste Generation Facility - means those facilities, equipment and operations that are involved in the production, collection, handling or storage of subject waste at a site.

Waste Management System - means all facilities, equipment and operations for the complete management of waste, including the collection, handling, transportation, storage, processing and disposal thereof, and may include one or more waste disposal sites (Environmental Protection Act).

Waste Reduction - the elimination, prevention or restriction of waste generation at its source.

Waste Shed - areas assumed to be sources of waste for a waste management program or facility.

Wastewater - water carrying dissolved or suspended solids.

Watershed - the total land area above a given point on a stream or watershed that contributes runoff to that point.

Watertable - the surface of underground, gravity controlled water.
- the surface of an unconfined aquifer at which pore water is at atmospheric pressure. It is generally located at the top of the zone of saturation in an unconfined aquifer.

Water Level - the measurement of the top of groundwater in a well. The water level is reported as a geodetic elevation to provide a common and comparative reference point.

Waterwall Furnace - a common method of energy recovery where furnace walls include closely spaced steel tubes. Water is circulated through these tubes where it is heated by radiant energy from burning solid waste.

Water Well Record - a record of information concerning a public or private water well which is prepared by a licenced drilling contractor.

Waybill - see Manifest.

Weathered - refers to the disintegration and decomposition of rock at or near the earth's surface caused by atmospheric agents.

Well Nest - a group of two or more observation wells found in one location and installed at different depths to monitor different geologic formations.

Wet Air Oxidation - a process by which organic materials suspended or dissolved in water can be substantially degraded (oxidized) by reacting with dissolved oxygen at high temperatures and pressures.

"Wet" and "Dry" Scrubbing Systems - a scrubbing system is used to remove contaminants from flue gas. A wet scrubber uses liquid reagents, which are injected into the gas stream to neutralize acid constituents and remove them as soluble salts. In a dry scrubber, dry (powdered) reagents are injected into the gas stream to revitalize acid constituents which can be removed as solid residues (salts) downstream.

Wetlands - land areas where excess water is the dominant factor determining the nature of soil development and the type of plant and animal communities living at the soil surface. Wetland soils retain sufficient moisture to support aquatic or semi-aquatic plant life.

Wet Milling - mechanical size reduction of solid waste after it has been wetted to soften the paper and cardboard constituents. Similar to pulping.

Wet Separation - the separation of residential solid waste at source of the organic or wet components from the "dry" types of waste. Wet wastes typically include food and yard wastes and are collected separately for processing at a centralized composting facility. Also see dry separation.

White Goods - generally refers to discarded stoves, refrigerators, and other large, abandoned enameled appliances.

Windrow - a long row of heaped material left on the ground in a controlled area. In composting, waste material is sometimes made into windrows so that the materials can be easily turned over.

Woodlot - a piece of land on which trees grow or are cultivated. The Ministry of Natural Resources has a Woodlot Improvement Act aimed at optional development and harvesting of woodlots in Ontario.

Working Face - that area of a landfill where vehicles are dumping waste and where landfill equipment is moving and compacting the waste into cells.